ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

OCTOBER 1954

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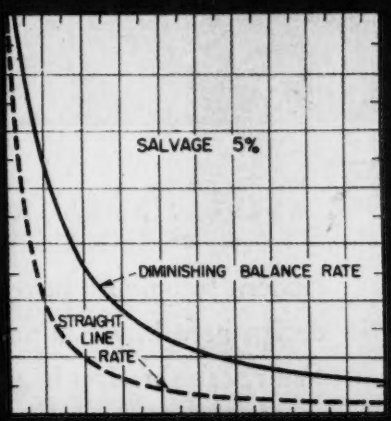
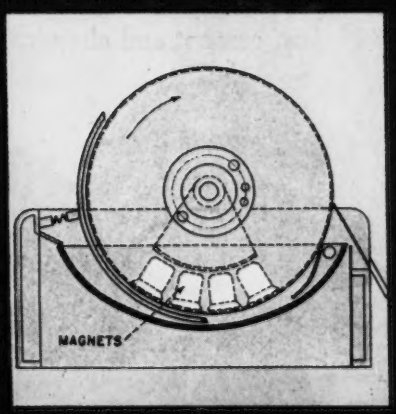
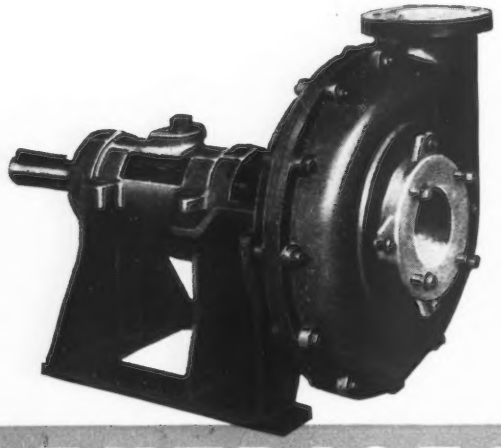




A needed recruit is making good

Modern techniques in required linings and basic principles of design used in A-S-H pumps 25 years ago together make the Centriseal abrasives-handling pump a worthy complement to the famous Hydroseal line. Allowed to beat its own drum for the first time last year, this product of A-S-H engineering experience is demonstrating its industrial efficiency in the mining, cement and chemical fields . . . and is getting repeat orders.

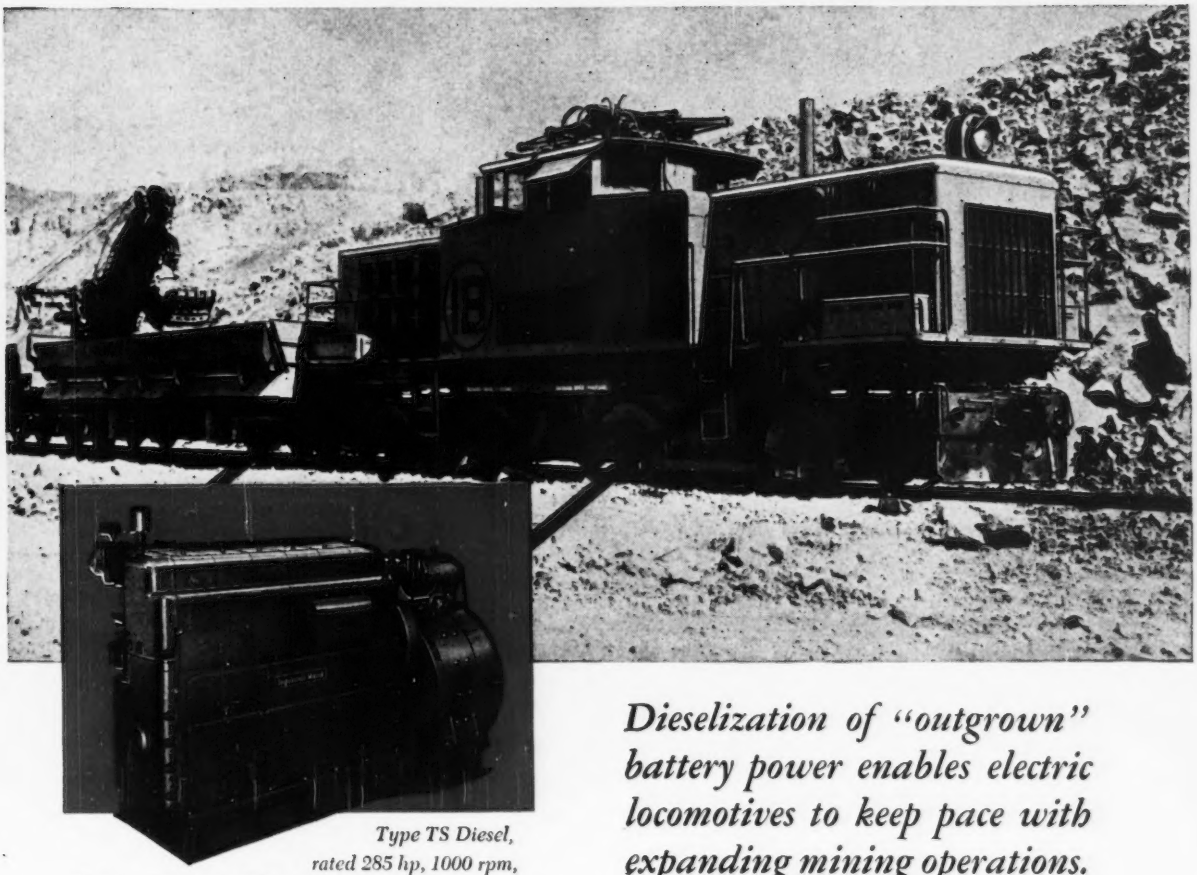


If your operating conditions reject the use of seal water, but you'd like to have pumps that closely approach the mechanical efficiency of Hydroseals, write for Centriseal Brochure No. 853.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

CENTRISEAL and HYDROSEAL
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

I-R DIESELS solve tough ore-hauling problem at open-pit mine



Type TS Diesel, rated 285 hp, 1000 rpm, direct connected to DC generator. Two of these units are installed in each of the ore-hauling locomotives.

Dieselization of "outgrown" battery power enables electric locomotives to keep pace with expanding mining operations.

At this huge open-pit copper mine, all ore-hauling locomotives operated originally on both storage batteries and overhead DC power. The batteries were used at the benches, where overhead lines were impractical and the power line was utilized for the run from mine to the crusher. This worked out fine until 1950. By that time the benches had been so extended that the batteries weren't able to complete the run. Larger batteries were impractical and the problem was referred to the locomotive manufacturer.

The answer—Ingersoll-Rand Type TS Diesels! Thirty-four 285-hp diesel generator units were used—two installed in each of the locomotives. Now bench length is no problem at all. And the DC power line can still be used for the long run to the crusher.

This is typical of the many applications where Ingersoll-Rand diesel engines are being profitably applied. Their dependability and economy in heavy-duty service are a matter of record. Available in sizes from 200 to 1000 hp. Ask your Ingersoll-Rand representative or branch office for complete details.

Ingersoll-Rand

7-118 11 Broadway, New York 4, N. Y.

Pumps • Compressors • Vacuum Equipment • Turbo Blowers • Rock Drills • Gas & Diesel Engines • Air & Electric Tools

ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 No. 10

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LETTERS

. . to out of up for?

SIR:

The genuine hand-painted necktie offered in your "Behind the By-Lines" (June 1954, p 70) belongs to Morris Bishop, whose verse in the *New Yorker* (Sept. 27, 1947) ran:

"The Naughty Preposition"
By Morris Bishop

I lately lost a preposition
It hid, I thought, beneath my chair
And angrily I cried, 'Perdition!
Up from out of in under there.'

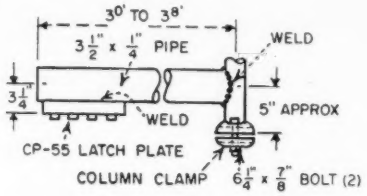
Correctness is my vade mecum
And straggling phrases I abhor
And yet I wondered what should he come
Up from out of in under for?

By permission, Copr. 1947 The New Yorker Magazine, Inc.

J. S. THWAITS, *London Secretary*
The Messina (Transvaal) Development Co.,
London, EC2, England

Ed: George Lutjen, who made the offer of hand-painted neckties as a suitable prize for sentences ending in more than five prepositions, is now attending a night school course in modern art and the finished originals should be forthcoming soon.

Apparently our British cousins are great New Yorker readers. Arthur R. Palmer, of Ipswich, Suffolk, England, also sent in the Bishop poem.



Column Mount for CP-55

SIR:

Just read Pat Adamson's article on "Diamond Drills' Place in Pit Blasting" (*E&MJ*, July 1954, p 96) and thought a few comments regarding the American practice are in order.

First, credit goes to Lynch Bros., diamond drill contractors, Seattle, for the development of a column which can be used in drilling at any angle. The column (see drawing above) was built to mount a CP-55 air-driven drill by means of a hinged latch plate to permit swinging the machine out of the way when pulling or lowering drill rods. The column has a clamp on the other end which, when clamped onto the stand-pipe, centers the machine over the hole. By using a heavy stand-pipe, the need for other bracing is eliminated.

This is a very handy device not only for underground work but (for the surface). Operation could be streamlined further by adapting the Australian meth-

(*Continued on p 116*)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

4½-mile conveyor uses B. F. Goodrich cord belts

THAT belt above is one of 14 on one of the longest outdoor conveyors in the world. As you can see, the belts must travel up steep hills and over rough ground. When the engineers planned the system, they specified B. F. Goodrich cord belts for these tough hauling sections.

Unlike the usual conveyor belts made of rubber and layers of fabric, the B. F. Goodrich cord belt is made with layers of separate cords, each surrounded by rubber, running the length of the belt. The cords make the belt strong so it can pull the load up steep hills and still be flexible enough to prevent spilling.

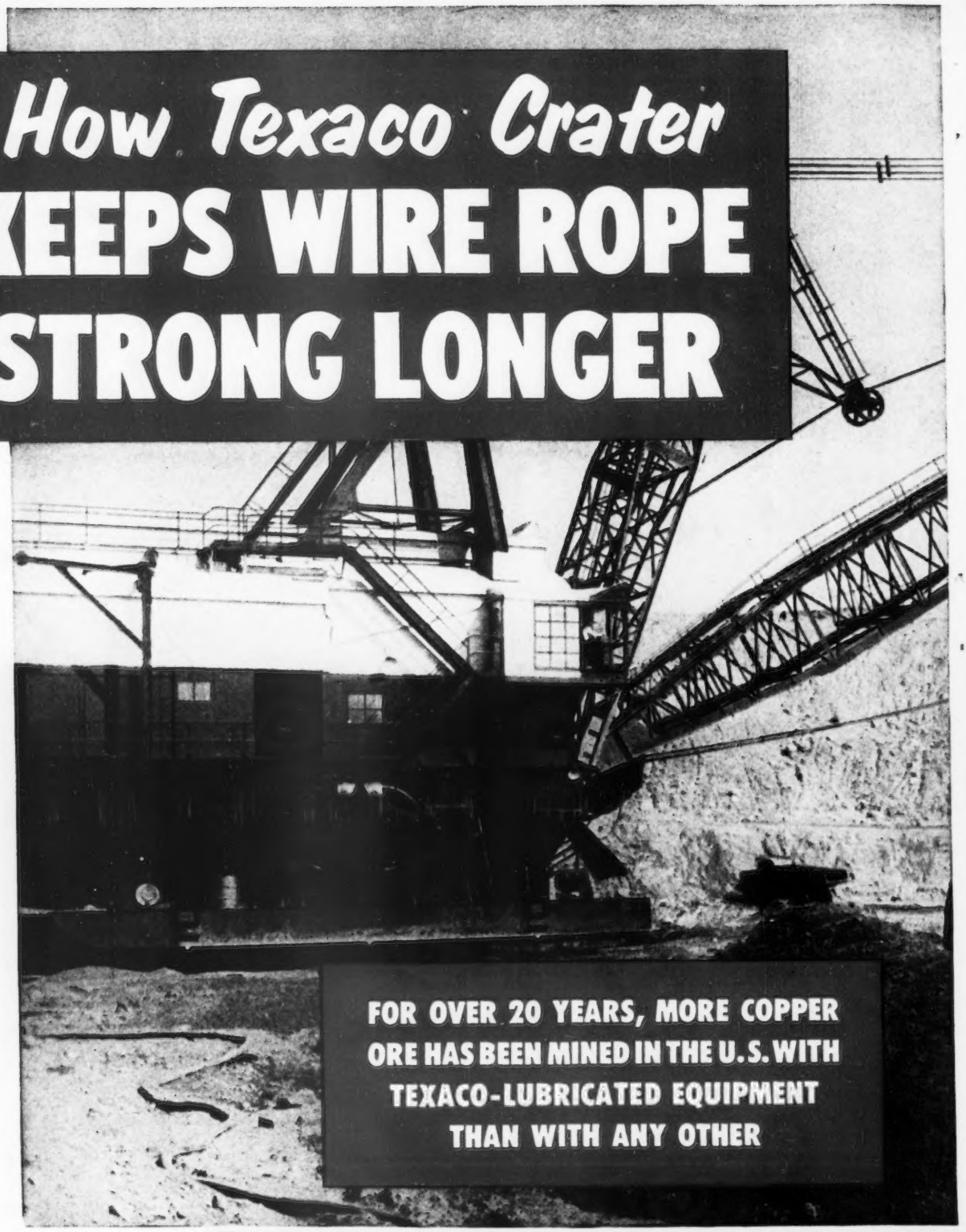
B. F. Goodrich cord belts handling wet material give double protection against mildew and rot. Since each cord is completely surrounded by rubber, a cut in the belt admits moisture to only those few cords exposed. There are no cords running across the belt to absorb and carry moisture. In addition, the belts are treated with special chemicals which protect against mildew.

This system hauls 800 tons an hour over the kind of ground you see above. The 36-inch wide belt travels 600 feet a minute delivering 800 tons of coal an hour from mine to electric power plant.

Whatever you move by belt—coal, rock, ore, sand, gravel, dirt—there is a B. F. Goodrich conveyor belt that can do it better and for less. Your local BFG distributor can show you how these longer-lasting belts can save money, or write *The B. F. Goodrich Company, Dept. M-321, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

How Texaco Crater KEEPS WIRE ROPE STRONG LONGER

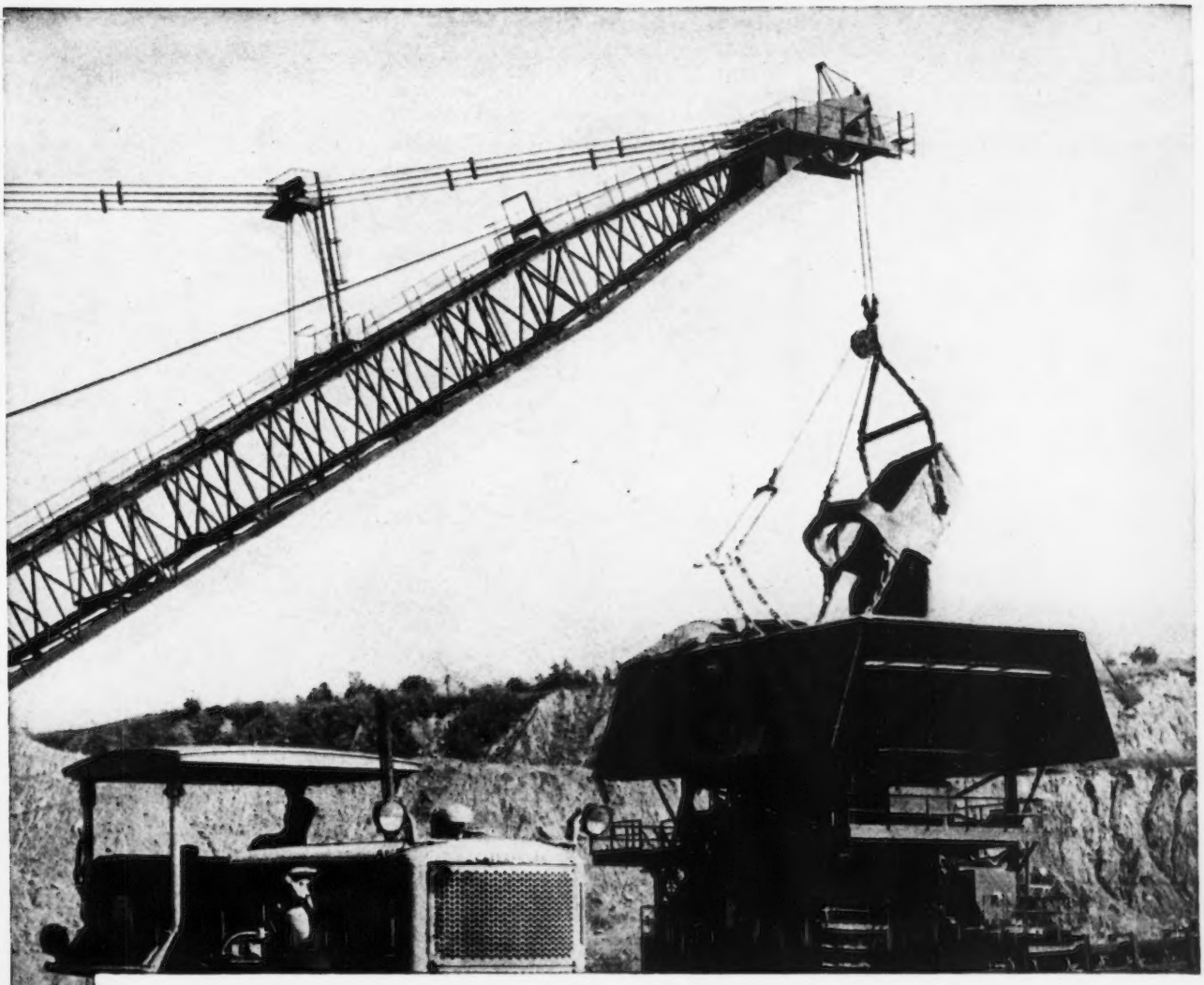


FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U.S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

TUNE IN:
TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR
on television
. . . Saturday nights, NBC

TEXACO

TEXACO



WHEREVER YOU use wire rope — above or below ground — *Texaco Crater* provides effective protection to keep maintenance costs low. *Texaco Crater's* penetrating action envelops each metal strand with a tough, durable, wear- and weather-resistant coating . . . surrounds the hemp core with a life-preserving film. Your rope stays strong longer, equipment stays on the job.

For open gears, too, use *Texaco Crater* and enjoy smoother, quieter operation. Your maintenance expense will be less because *Texaco Crater* clings to gear teeth, won't ball up or throw off, resists shocks and loads, minimizes wear.

For extra convenience in application on either wire rope or gears, you may prefer *Texaco Crater X Fluid.* Without heating, it *goes on* easily as a liquid . . . *stays on* just like the regular *Texaco Crater.*

In mine car wheels, use *Texaco Olympian Grease.* In cold weather as in warm, it assures easy, dependable starts . . . gives all types of bearings long-lasting, cost-reducing protection.

A Texaco Lubrication Engineer can help you cut costs throughout your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels

FOR THE MINING INDUSTRY

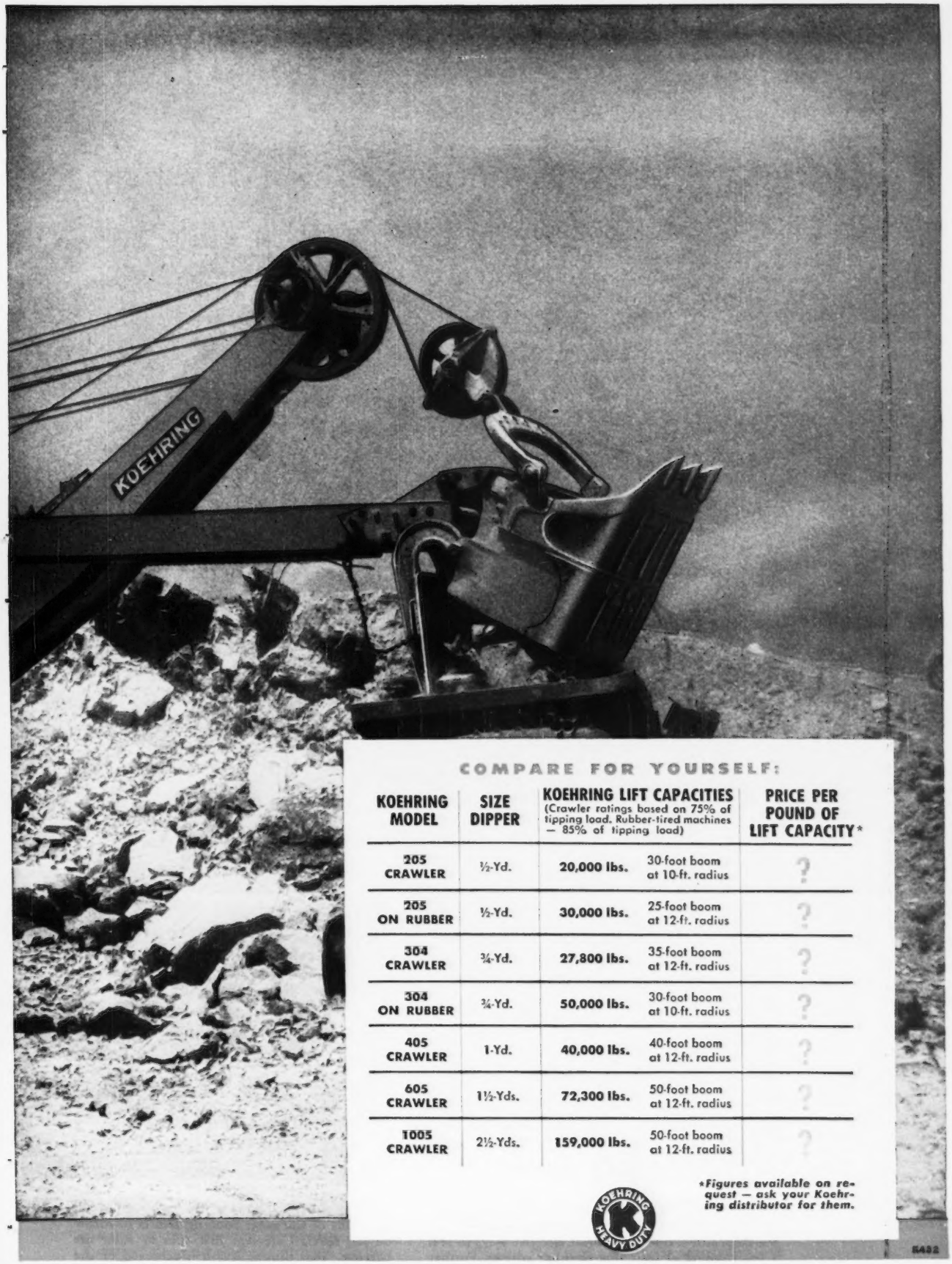
Measure excavators

by price per pound of lifting capacity

In analyzing shovel operation, you will find that price per pound of lifting capacity on crane rating is also an excellent measurement of excavator value. Remember, lift capacity is *work capacity*. Obviously, the machine with the heaviest lift rating not only picks up larger crane loads — it also has more strength, speed and stability to handle bigger loads faster with every excavator attachment.

Check Koehring lift ratings shown on the next page — then ask your Koehring distributor to give you the figures on price per pound of lifting capacity.

KOEHRING COMPANY Milwaukee 16, Wis. Subsidiaries: JOHNSON PARSONS • KWIK-MIX



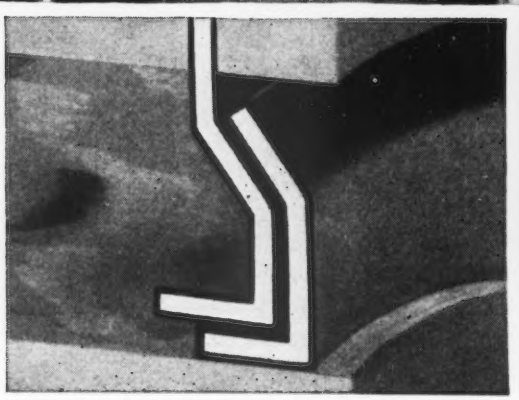
COMPARE FOR YOURSELF:

KOEHRING MODEL	SIZE DIPPER	KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load)		PRICE PER POUND OF LIFT CAPACITY*
205 CRAWLER	½-Yd.	20,000 lbs.	30-foot boom at 10-ft. radius	?
205 ON RUBBER	½-Yd.	30,000 lbs.	25-foot boom at 12-ft. radius	?
304 CRAWLER	¾-Yd.	27,800 lbs.	35-foot boom at 12-ft. radius	?
304 ON RUBBER	¾-Yd.	50,000 lbs.	30-foot boom at 10-ft. radius	?
405 CRAWLER	1-Yd.	40,000 lbs.	40-foot boom at 12-ft. radius	?
605 CRAWLER	1½-Yds.	72,300 lbs.	50-foot boom at 12-ft. radius	?
1005 CRAWLER	2½-Yds.	159,000 lbs.	50-foot boom at 12-ft. radius	?

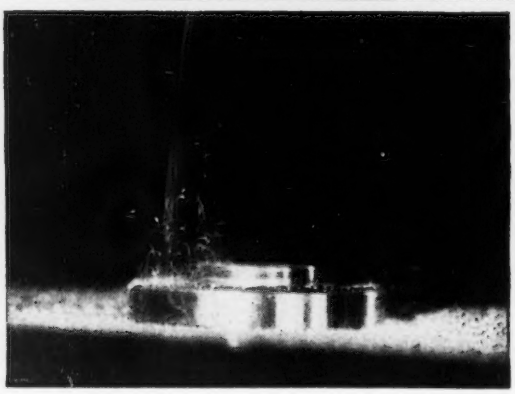
*Figures available on request — ask your Koehring distributor for them.

KOEHRING HEAVY DUTY

5432



POSITIVE LABYRINTH. A joint is only as effective as its seal. Countless research studies have shown that the labyrinth is one of the most effective ways to seal a joint where at least one member rotates. Further sealing action is achieved by the film of grease that fills the minute clearance between the two seals.



FLINGER ACTION. One of the most important functions of the outer rotating seal is to throw off any foreign element that tries to enter the bearing. This flinger action is achieved by the centrifugal force set up by the rotating seal. Elements attacking the bearing are repelled.

Exclusive 4-way seal guards new Life-Line A bearing

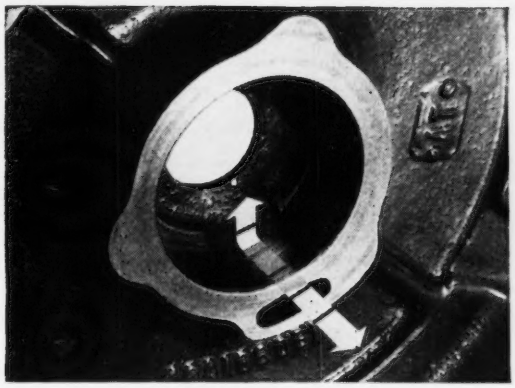
Here's why you can count on reliable Life-Line A motor performance

There are three factors that affect motor bearing life: (1) type of lubricant, (2) amount of lubricant, and (3) presence of contaminants. The one *sure* way to control all three is to use a bearing that is pre-lubricated at the bearing manufacturer's plant and then SEALED.

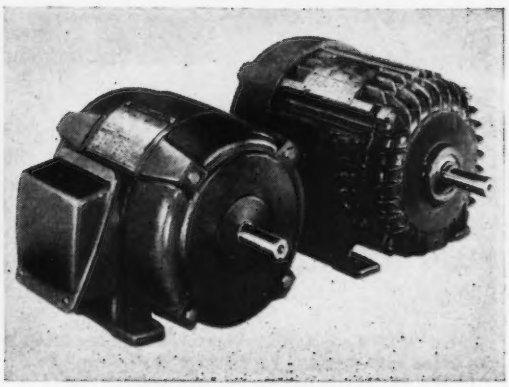
Many of the original Life-Line® pre-lubricated bearings installed in 1937 have been running ever since and are still like new. Now, Westinghouse offers another important step ahead... a pre-lubricated motor bearing that has *four* seals... two on each side. Here's real bearing protection. Grease is sealed in. Contaminants are sealed out. No on-the-job greasing is required—EVER.

This new concept in motor bearings is one of the many improvements Westinghouse has incorporated into the complete, balanced design system that makes the Life-Line "A" motor your best buy. Get all the facts from your local Westinghouse sales engineer. Or write for Booklet B-6154-A. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21849

YOU CAN BE SURE... IF IT'S Westinghouse



AIR BY-PASS. Totally-enclosed motors "breathe" as the internal air expands and contracts with change in temperature. Ordinary motors "breathe" along the shaft and through the bearings. Life-Line provides an air by-pass around the bearings to keep out contaminating air.



The performance of any motor is dependent on the performance of each component of that motor. It takes balanced design. That's why every component in the new Life-Line "A" motor has been redesigned and integrated with the whole. The result is a motor with superior performance and consistent dependability.

Wire Rope at Work—This is the double-track or twin-slope haulage system used at a large Alabama mine. Up the slopes to the surface come heavily-loaded strings of cars, the trains being hauled by staunch wire rope.

The Bethlehem rope in the picture has an interesting history. This 1-in. Purple Strand line had been working for more than three years when the photograph was taken; had hauled approximately 1,000,000 tons of coal, rock, and other heavy materials. It had equalled the all-time record for the operation at this particular mine, and was still going strong, with new records in prospect.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:
MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

*Maximum Footage – Maximum Economy

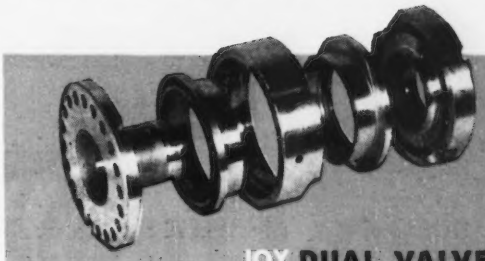
with JOY DUAL-VALVE SILVER STREAK DRILLS

In tunnels, crosscuts, drifts, or stopes, Joy *Silver Streak* Rock Drills with the DUAL VALVE will do your drilling job faster, and use less air with lower maintenance. Here's why—

(1) The exclusive DUAL VALVE, a feature of all Joy rock drills, makes air do more work. By admitting the correct amount of air behind the piston and excluding air ahead of it during the drilling stroke, maximum force is exerted on the drill steel. There's no cushion of air ahead of the piston to reduce the force of the blow. Then the rear section of the Dual Valve meters the correct amount of air ahead of the piston to force it back with a "snappy" rotating action. This adds up to more power-packed strokes per minute, for faster drilling with less air.

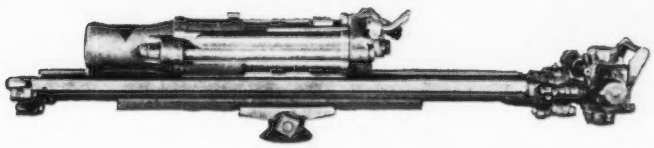
(2) The silver-like cadmium plating on Joy *Silver Streak* Rock Drills aids lubrication while running-in, protects parts from rust while in stock, and keeps maintenance costs at a minimum.

The Joy line is complete. There's a *Silver Streak* rock drill for every rock breaking need. Types included are drifters, stopers, hand-held drills, Hydro Drill Jibs. To complete the line, there are wagon drills; the QB-20 for line drilling and dimension stone quarries; rubber-tired, self-propelled Drillmobiles; and specially mounted drills for special needs. Let our Field Men work with you. • *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada, *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



JOY DUAL VALVE

"Makes Air do More Work"



JOY **DRIFTERS**

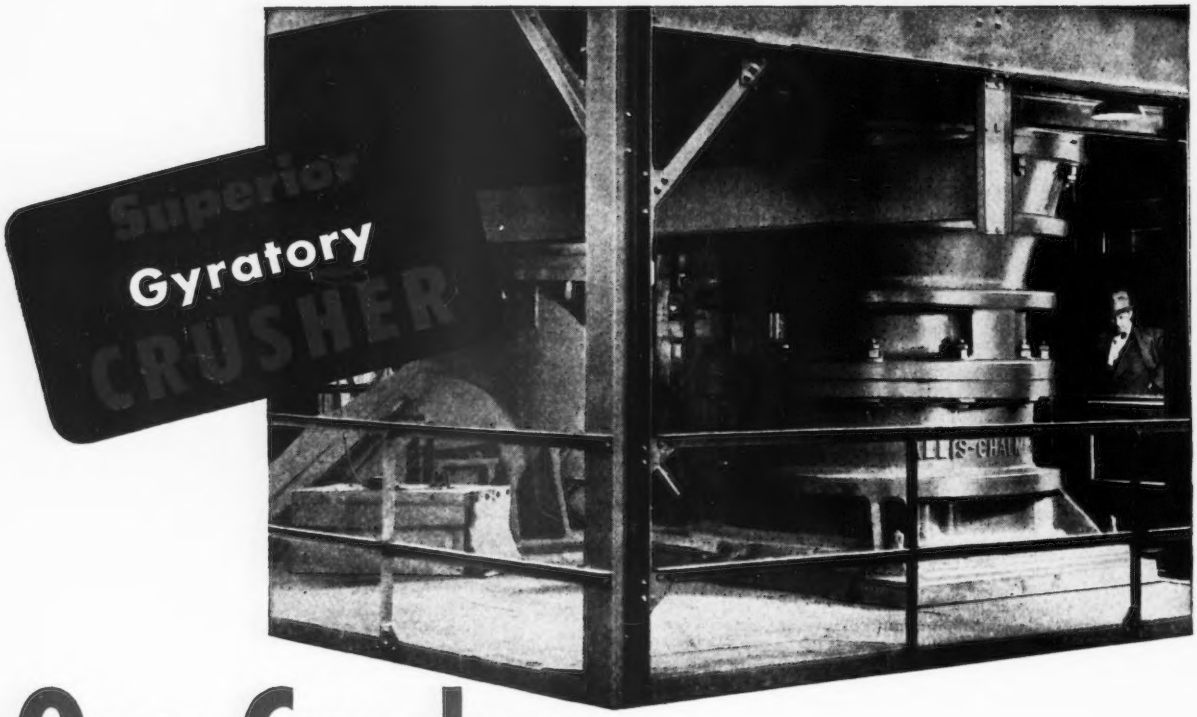
For use on mobile jumbo units, as at right, or for column mounting, Joy Drifters are built in three sizes—all with fast, powerful Dual Valve action. Efficient Pistonmotor Feed, with only two moving parts, provides strong, steady, advancement and retraction. One-piece locking chuck increases bearing area and reduces wear on lock ring and chuck bushing.

Consult a Joy Engineer

JOY

WAD 3760

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT



One Crusher... Does Work of Two!

HOMESTAKE MINING Company installed a modern 30-55 *Superior* gyratory crusher to replace two old *Gates* gyratories. Despite the fact that the new crusher has a 30-inch feed opening, instead of a 17-inch opening as on the old crushers, it fits snugly into half the former space for two. The *Superior* can turn out much more tonnage than both old crushers. And it's built to surpass the 38-year service record of the old crushers.*

This increased capacity and improved performance is a direct result of over 70 years of experience in building crushers, years in which Allis-Chalmers leadership introduced many design advantages in gyratory crushers — the short mainshaft . . . improvements in the shape and size of the crushing chamber, in weight distribution, in dust protection and lubrication. These and other features mean more *profitable* crushing for you, when you specify Allis-Chalmers!

A-4195

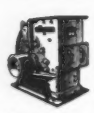
For more facts on *Superior* primary or secondary crushers, call the Allis-Chalmers representative in your area or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 07B7870.

**Yes, the old Gates crushers were built by Allis-Chalmers too — back in 1913!*

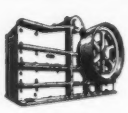
Superior and Gates are Allis-Chalmers trademarks.

ALLIS-CHALMERS

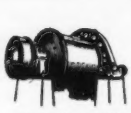
Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.


Hammermills

Vibrating Screens


Jaw Crushers

Gyratory Crushers


Grinding Mills

Kilns, Coolers, Dryers

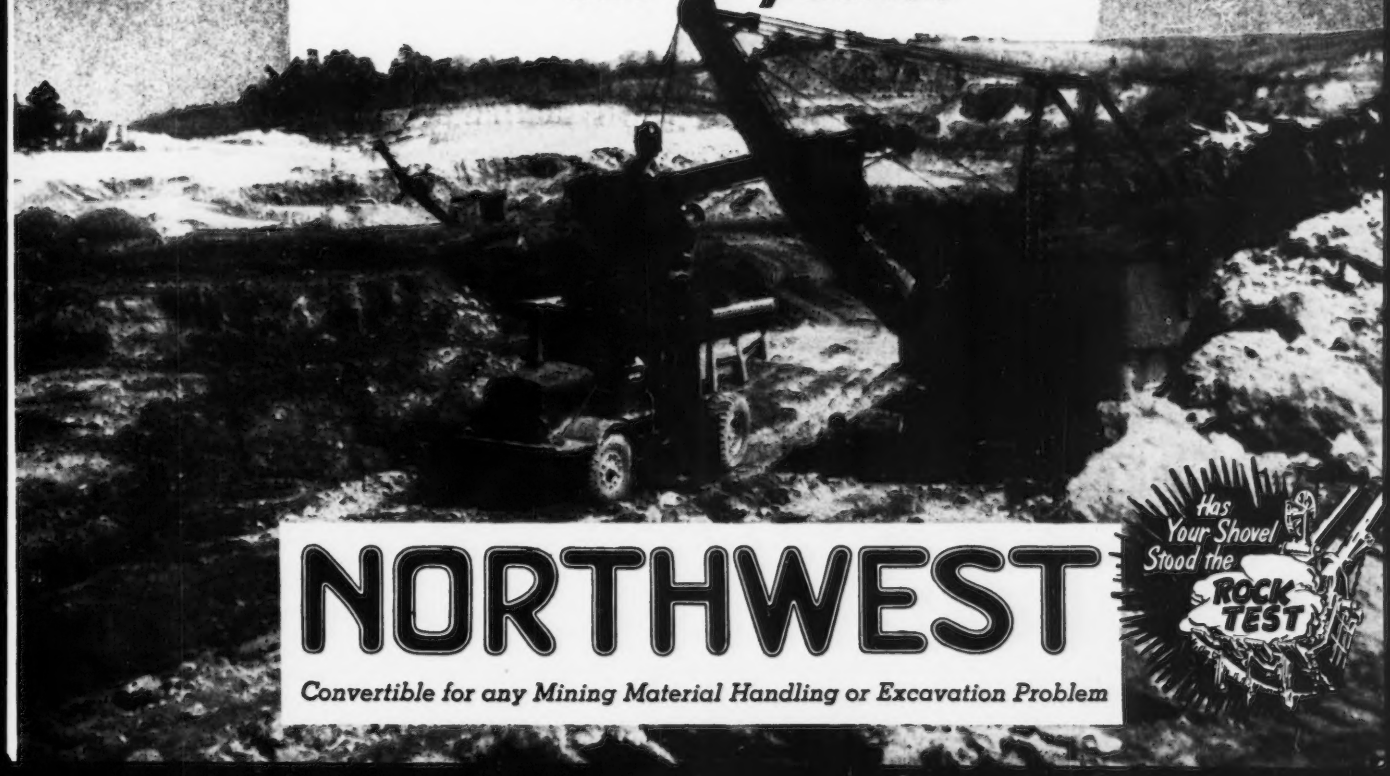
HERE are two Northwests in the pits of the Aluminum Company of America at Bauxite, Arkansas. The Mining Division is well acquainted with what Northwest performance means for the Aluminum Company has had many Northwests, both in the United States and Abroad.

This is another of the many types of mining work that Northwests are doing across the country. Northwest speed is outproducing larger, slower equipment. Northwest simplicity and dependability eliminates constant irritation and lost time caused by minor adjustments. Northwest steering smooths out the travel problems always present in stripping and assures easier, faster relocation on floors and benches.

Easy convertibility from Shovel to Crane or Dragline gives you the versatility that adapts a machine to the problems of *either* pit or plant. Now is the time to consider a Northwest. Let a Northwest Man tell you more about the many other Northwest advantages.

NORTHWEST ENGINEERING COMPANY
1509 Field Building • 135 South La Salle Street • Chicago 3, Illinois

at BAUXITE ARKANSAS they have used NORTHWESTS for years!

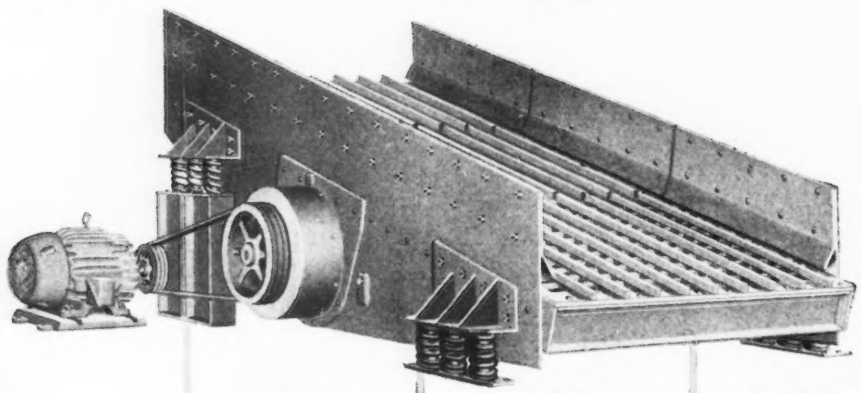


NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

Heavy-duty scalping's BIG 4

...your assurance of top performance



1 GREAT STRENGTH

Massive frame utilizes heavy-section ship channels and H-beam members. Welded deck is securely riveted to thick side plates. This stress-relieved construction easily withstands up to 40-in. boulders dropped from feeder.

2 HIGH CAPACITY

Efficient vibrator mechanism permits screening extremely high capacities of sticky ore. Deck can be perforated plate or grizzly.

3 EFFECTIVE SEPARATION

All vibration is isolated from foundation by large, square-end helical springs and concentrated in the live deck for thorough action of the deepest bed.

4 TROUBLE-FREE OPERATION

Automatic controls limit motion during acceleration and deceleration. Over-size, self-aligning, taper-bore roller bearings with hydraulic bearing removal device insure long life and ease of maintenance.

New LINK-BELT vibrating screen combines all the features essential to low-cost ore handling

HERE'S the ruggedness of a grizzly teamed with the proved efficiency of a vibrating screen. Developed by Link-Belt to meet every requirement of the Range—it's the ideal answer for heavy run-of-pit applications.

Your Link-Belt representative can give you complete information on this new heavy-duty scalping screen. Contact him today, or write for your copy of Folder 2461.

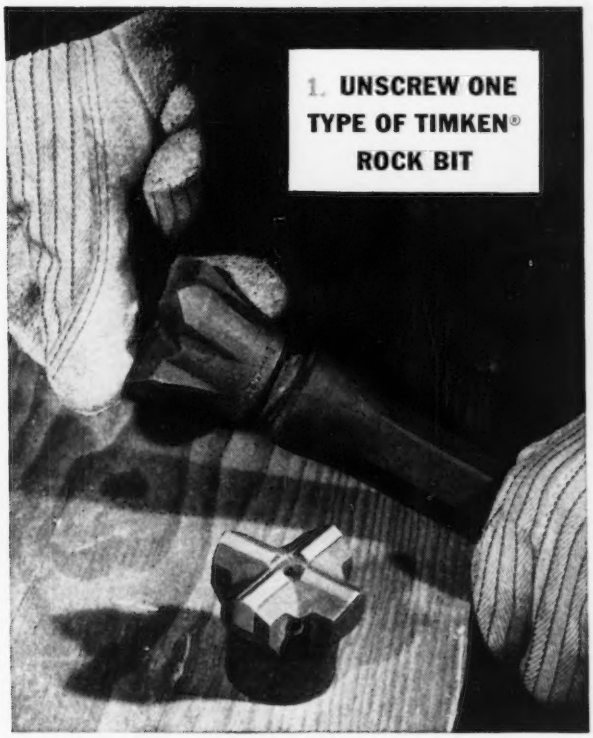
LINK-BELT

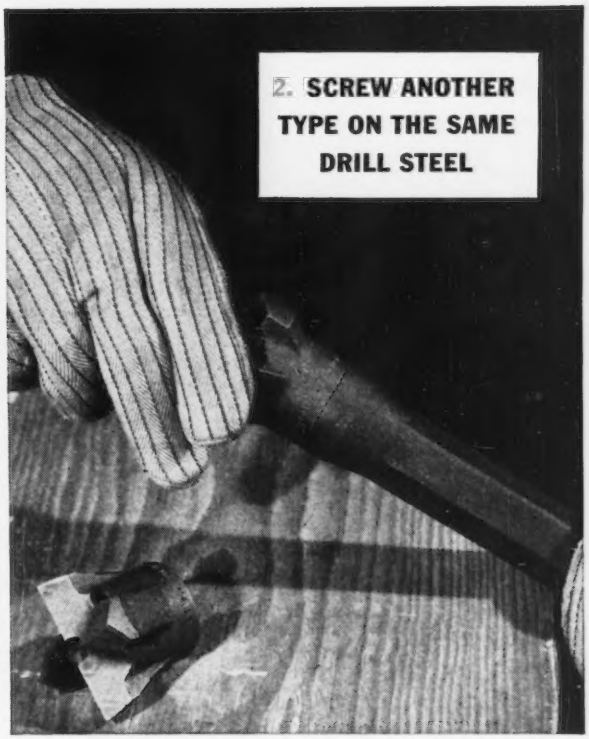
VIBRATING SCREENS

Note the size of the large boulder handled by 5 x 14 ft. Link-Belt heavy-duty scalping screen at a mining firm's Mesabi plant.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth 2, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 13,324

HOW TO SWITCH ROCK BIT TYPES WITHOUT LOSING TIME





TIMKEN® carbide insert and multi-use bits are interchangeable on the same drill steel!

DRILLING time goes to waste every time drillers have to change steels to accommodate different types of rock bits. But with Timken® multi-use and carbide insert bits, this costly delay is eliminated. Dozens of them fit the same threaded drill steel. All the driller has to do is unscrew one type and screw on another. No need to change steel, no need for the driller to leave the job.

That's the way to get the most benefit from switch-bit drilling—switching bit types as the ground changes. You save drillers' time and there's no necessity of stocking large inventories of drill steels.

All Timken multi-use and carbide insert bits are manufactured from electric furnace Timken fine alloy steel. Their special shoulder unions keep drilling impact from damaging the threads.

Our rock bit engineers will be glad to help you with your drilling problems through careful analysis of your operations. They're recognized as experts in reducing drilling costs, so call on them now. There's no obligation. Just write to The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken Multi-Use Rock Bit

Timken Carbide Insert Rock Bit

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit ...for every job

Increase your footage

Use CLEVELAND Air Legs and Drills...the easiest way

THE FEED YOU NEED — FROM ZERO FEED TO FULL LINE

Eleven detent positions enable drill operator to set and maintain pressures in a range from zero to full-line feeding pressure — with an increase of 9 psi at each setting. That's why a CLEVELAND Air Leg and H10AL Drill combination gives top performance in any kind of rock.

Shown here is a **CLEVELAND AL-92** Telescopic Air Leg with H10AL Drill. Because of space limitations, full length isn't shown

CLEVELAND AL-92 Telescopic Air Leg with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Standard, automatic controlled wet-type backhead.

Chuck sizes	7/8" x 4 1/4" — or other popular steel shank sizes	
Weight	60 lbs.	
Air Hose	3/4"	
Water Hose	1/2"	
Full feed travel	4'	6'
Collapsed feed	2' ea. piston	3' ea. piston
Closed length	48"	60"
Extended length	96"	132"
Air leg weight	37 lbs.	42 lbs.

CLEVELAND AL-90 Single Extension Air Leg for use with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Weight	60 lbs.
Air Hose	3/4"
Water Hose	1/2"
Feed Travel	36" — 48" — 60"
Closed Length	56 3/4" — 69" — 81 1/4"
Extended Length	92 3/4" — 117" — 141 1/4"
Air Leg Weight	30 lbs. — 34 lbs. — 37 lbs.

CLEVELAND AL-91 Single-Extension Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Standard wet, or automatic controlled, wet-type backhead available.

Air hose	3/4"
Water hose	1/2"
Feed travel	36" — 48" — 60"
Closed length	58" — 71" — 83"
Extended length	94" — 119" — 143"
Air leg weight	35 lbs. — 38 lbs. — 41 lbs.

per man-shift!

to drill rock

Choose the drilling combination that's best for you from the industry's only complete line of telescopic or single-extension air legs.

MINERS like to use a CLEVELAND Air Leg and H10AL Drill combination. It gives them real flexibility — they can use it as a drifter . . . as a stoper . . . or as a hand-held drill . . . set-ups are quick and easy.

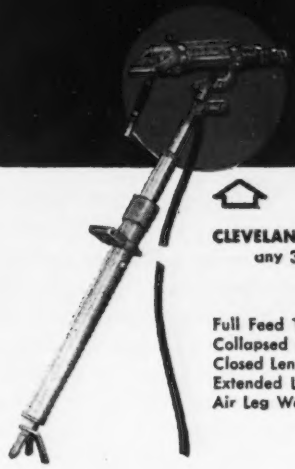
It's an easy-handling combination, also. The air leg supports the drill and absorbs fatiguing recoil. You get flexible feeding pressure, too — from zero to full line. That's why miners drill more footage with CLEVELAND, yet are less tired at the end of their shift.

Exclusive CLEVELAND built-in feed control in the H10AL Drill eliminates a third hose and cumbersome "Y" connections. There's no feed-control bleed valve — the operator doesn't have to bleed off air continuously, to maintain suitable feeding pressure. He can change or advance the position of the leg easily and quickly.

The air leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains.

These are ways a CLEVELAND Air Leg and H10AL Drill combination helps you get more drilling for less cost. Take advantage of them.

Write today for Bulletin RD-30 for complete information.



CLEVELAND AL-93 Telescopic Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Full Feed Travel	4'	6'
Collapsed Feed	2' ea. piston	3' ea. piston
Closed Length	50"	62"
Extended Length	98"	134"
Air Leg Weight	42 lbs.	47 lbs.

CLEVELAND ROCK DRILL DIVISION

Westinghouse Air Brake Co.

12500 BEREA ROAD • CLEVELAND 11, OHIO

RD-58

Plants: Milwaukee, Wisconsin • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Michigan

That's right mister! YOU'RE POINTING TO GREATER EFFICIENCY

When you point to that CP Airleg combination, Mister, why not point out that they team up to give the maximum drilling efficiency obtained when using Tungsten-Carbide bits. And that the leg takes constant recoil shock yet holds the drill firmly to the work. And while you're at it, point to the exclusive pressure release type control handle and balanced feed leg that assure steady bit pressure even under variable line pressure and different rock formations – eliminate "slapping" and reduce bit breakage. Then point to the emergency push button that releases feed-leg pressure instantly. Point out that it's available with a feed cylinder of either steel or aluminum alloy and with 36″ and 48″ feed travel. And that it makes a perfect combination . . . the Chicago Pneumatic Airleg and Sinker Drill! And if your friend has any more questions, Mister, ask him to write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

IT PIERCES ROCK AT 25 ft./hr.

and only EMERALD CORD Hose stands the pace

GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
EMERALD CORD HOSE
A Nonporous, nonflaking, oil-resistant synthetic tube
B Horizontal-braided, "Adhezo"-impregnated, high-strength cord for thinner walls, greater adhesion, extreme flexibility
C Super-tough, nongouging, green cover

SUSPENSION BLOWPIPE JET PIERCING MACHINE burns its way through granites, taconites, quartzites, dolomites and similar rock at 20 to 30 feet per hour. Note hose following the burner right down the hole. Photos courtesy Linde Air Products Company.

Emerald Cord—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

THIS machine literally burns blast holes into solid rock at 15 to 20 times normal drilling speed. Its white hot flame—well over 3000° F.—creates great thermal stresses that crumble the rock into fine particles. Water, also used to cool the burner, is ejected into the hole, turns to steam and blows these particles to the surface.

Big problem for designers was getting the kerosene, oxygen and water down to the blowpipe. Hose was the only answer. But every one they tried failed in a day, or less, from the rugged combination of steam, fuel, oxygen and severe abrasion by sometimes red-hot rock particles.

Their troubles ended, however, when the G.T.M.—Goodyear Technical Man—recommended EMERALD CORD Hose. This super-tough, horizontal-braided, "Adhezo"-bonded hose takes the rough treatment in stride—lasts for months—is now part of the specifications. For similar help on hose, see your Goodyear Distributor and the G.T.M., or write Goodyear, Industrial Products Division, Akron 16, Ohio.

YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the Yellow Pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

GOODYEAR

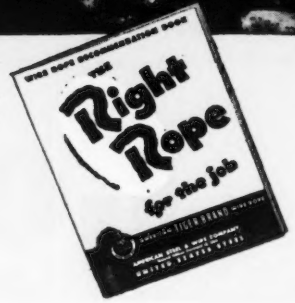
THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

12,587 carloads of

American Steel & Wire
Room 842, Rockefeller Building
Cleveland 13, Ohio

FREE ROPE BOOKLET →



Please send me, without obligation, a copy of your booklet, "The Right Rope for the Job," which lists the correct Tiger Brand Ropes to use for hundreds of typical applications.

Name.....

Address.....

City & State .....

overburden moved with one Tiger Brand Hoist Rope

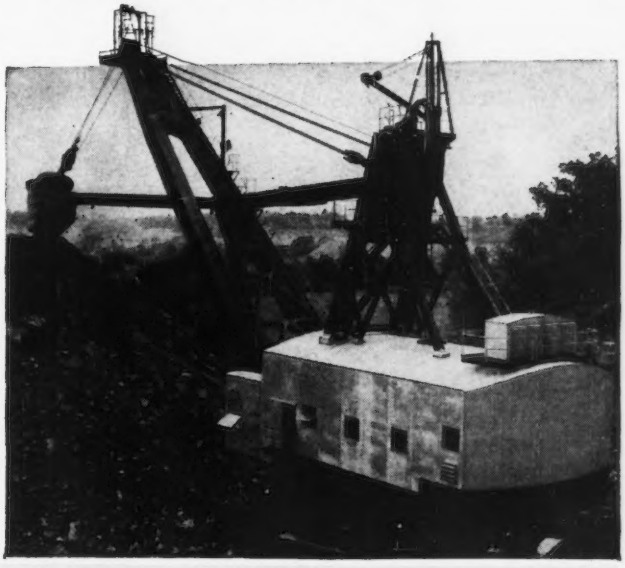
IMAGINE 12,587 50-ton freight cars strung out end-to-end. They would make a train more than 80 miles long; and if each car was level full, the entire train would contain 1,000,000 cubic yards of material. That's how much overburden this big coal stripping shovel moved with one American Tiger Brand Hoist Rope.

Despite hard digging, a 2⅜" Tiger Brand Wire Rope lifted and lowered the fully loaded 45 cu. yd. bucket *20,000* times before it had to be replaced. This equipment is used by Central Ohio Coal Company which supplies coal for The Ohio Power Company's new Muskingum River electric power generating plant. This company also uses Tiger Brand Wire Rope on its 18 cu. yd. shovels.

You will like Tiger Brand, too. It lasts long in *any* type of service.

Send the coupon for our recommendations of the right rope to use on your machines.

Regular lubrication of sheaves helps prevent excessive wear of the Tiger Brand Ropes on these big machines.



This 18 cu. yd. electric shovel and the 45 cu. yd. job shown on the opposite page are stripping overburden 3 shifts a day *every* day at Central Ohio Coal Co.'s big Muskingum Mine near Zanesville, Ohio. Tiger Brand Rope is giving excellent service on both these hard-working machines.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

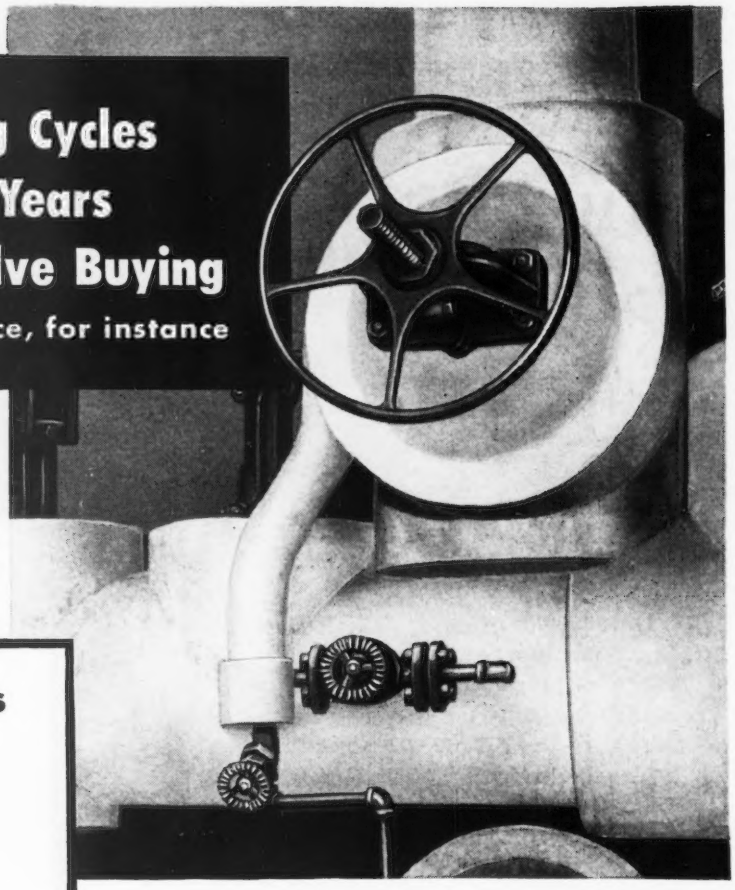
U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

1248 Operating Cycles Through 24 Years Prove Quality Valve Buying

. . . for main steam service, for instance



The Installation

At the Champion-International Paper Mill, Lawrence, Mass., featuring Crane 400-pound steel gate valve in main steam line to turbine. Working pressure: 400 psi at 600 deg. F.

Valve Service Ratings

SUITABILITY: Never a question

FEATURES: Quality throughout

MAINTENANCE COST: Not a cent

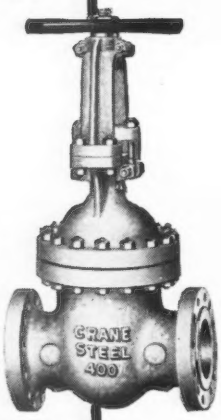
SERVICE LIFE: 24 yr.—still in line

OPERATING RESULT: Lower power costs

AVAILABILITY: Regular Crane Catalog item

The Valve

Improved constantly through the years, Crane steel valves for elevated pressures and temperatures are known and respected everywhere for outstanding, low-cost performance. They're made in the widest range of body and trim materials—in all pressure classes and sizes—with screwed, flanged, or welding ends. See your Crane Catalog, or consult your Crane Representative.



The Case History

Installed in 1930, this Crane valve has been in continuous use ever since. In 24 years the valve has not required service or maintenance of any kind.

More significant is the quality of performance of this 8-in. steel gate valve. Operated for week-end shutdown of the turbine, it has never failed to respond to the handwheel with smooth, steady action. Both seating and stem seal remain as tight as when the valve was first installed.

Performance like this begins in just one way—by making quality the first consideration when buying valves. Today, such a buying policy is sounder than ever and Crane quality, more than ever, helps assure the best results at lowest ultimate cost.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

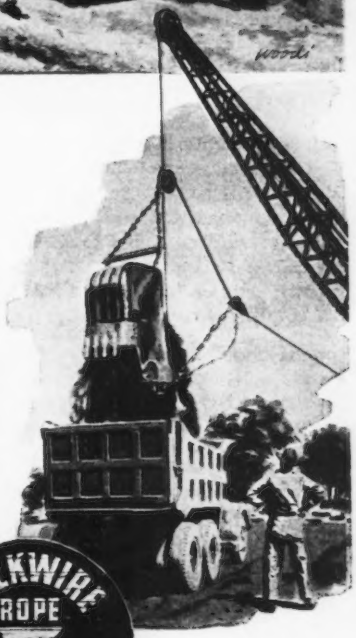
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

the dirt flies faster—now with MUSCLES OF STEEL

Straining laborers plying pick and shovel are a bygone memory because of today's excavating and road-building equipment. Modern power shovels and draglines use *muscles of steel*—rugged wire rope—to keep the dirt flying fast.

Helping to clear the way for needed highways is another of the important ways in which Wickwire Rope contributes *muscle* to America's might.

You'll find Wickwire Rope, too, in the mines and the quarries . . . in the oil fields and logging camps . . . with the fishing fleets . . . and in numerous materials handling operations. Whatever the job may be, the extra care and quality fabrication that goes into Wickwire Rope proves itself in longer life, more economical service and utmost reliability.



every industry benefits from wire rope

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2533

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

The Engineer's Report

CASE HISTORY

PRODUCT *RPM Delo Oils*

FIRM *Bagdad Copper Corp., Bagdad, Arizona*

Biggest truck in the world uses RPM DELO Oil!

246,000 POUNDS TOTAL LOAD, 48 tons of truck and 75 tons load, are hauled out of the Bagdad Copper Corp.'s ore pit at Bagdad, Arizona, by the two 350 h.p. supercharged diesels in this unit. RPM DELO Special Lubricating Oil is used in the engines as specified by Mr. Ernest Dickie, General Manager of Bagdad, on the basis of his years of experience with RPM DELO Oils in many other heavy-duty engines.

The big truck, described as the largest in the world, was designed by Mr. Dickie and engineers of Dart Truck Co., builders. Power is transmitted through 3-stage torque converters. All controls are powered.

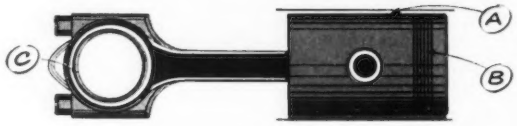
FREE FOLDER tells you about all the RPM DELO Oils and how they meet every heavy-duty engine condition. Write or call for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your nearest distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF

How RPM DELO Oils reduce wear, corrosion, oxidation in all heavy-duty engines



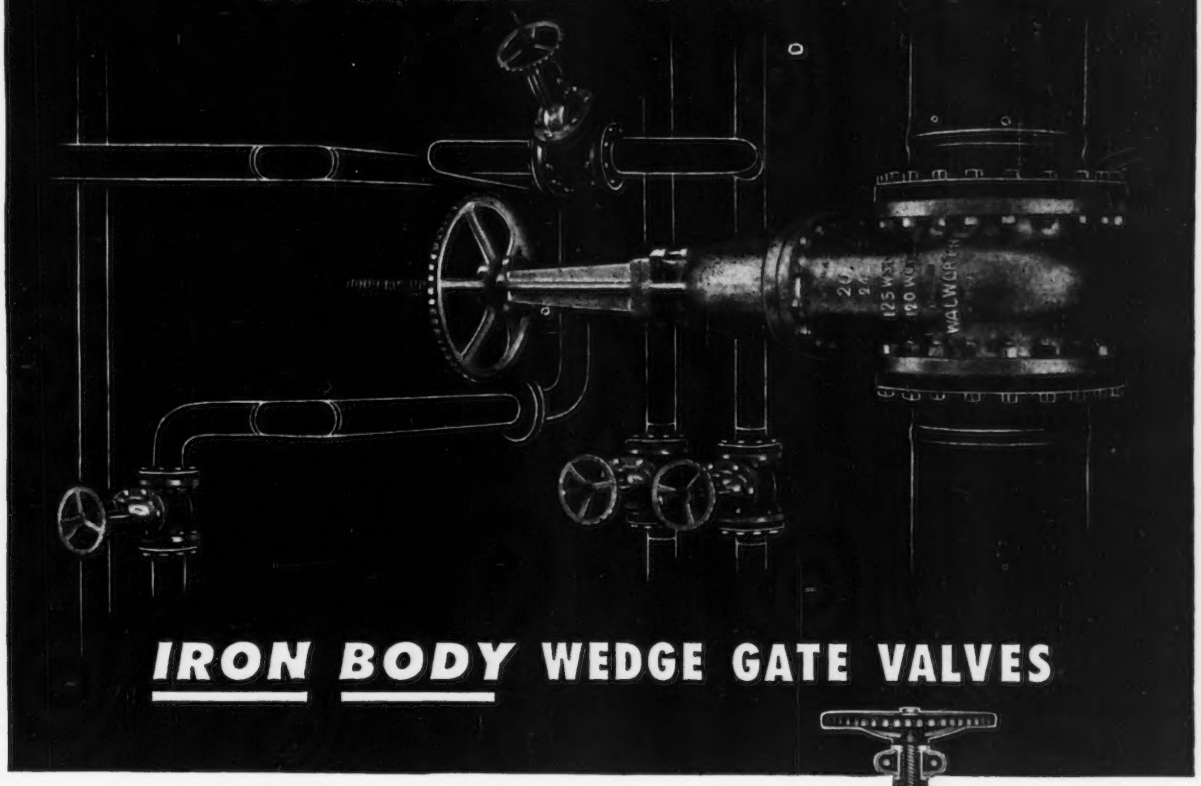
A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

WALWORTH

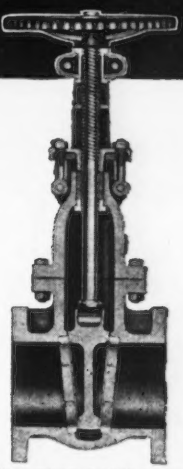


IRON BODY WEDGE GATE VALVES

Better because ...**The entire valve, from handwheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.**

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as ¼-inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

STURTEVANT
MICRONIZER*
GRINDING MACHINE

Grinds Materials To Any Micron Size Specification

NOW AVAILABLE FOR OUTRIGHT SALE

24" Size
Capacities 1000 to 1200 lbs. per hour

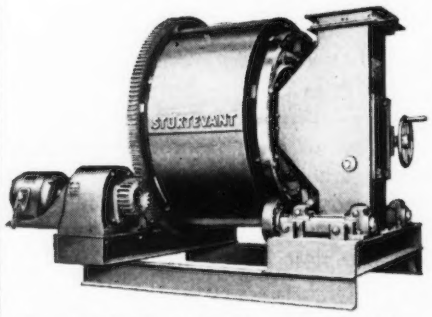
The Sturtevant *Micronizers* are fluid jet grinding machines designed to reduce solid materials to particle sizes in the micron range.

Using compressible fluids, air or steam, as the source of energy, *Micronizers* produce pulverized materials to specifications unobtainable by other mechanical equipment such as ball, pebble or hammer mills.

The variety of materials processed is large and includes both nonmetallic and metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products.

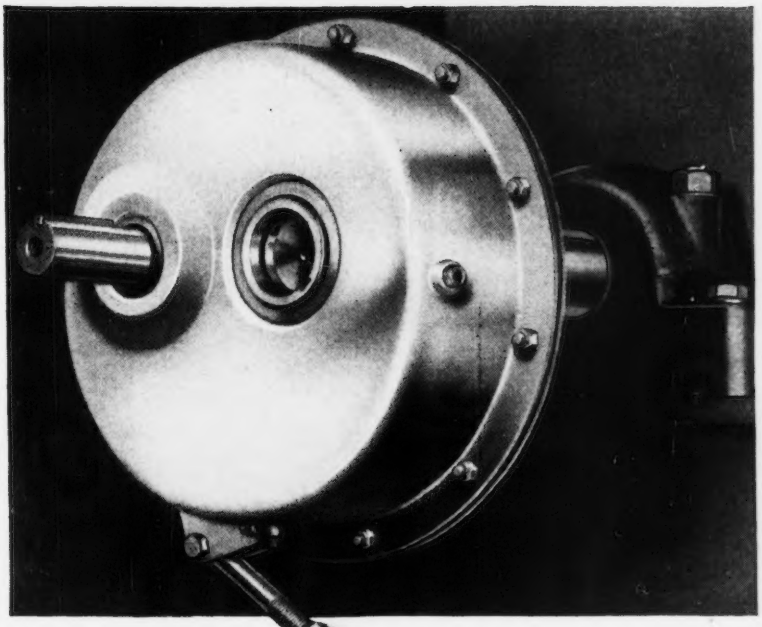
It is quickly and easily cleaned on changes of formulation with minimum loss of material. Simple to install and operate. It is available as a machine alone . . . or as a complete grouping with premixing, grinding and bagging equipment. Write for complete information, today.

*Micronizer is the Registered Trademark of the Sturtevant Mill Company.

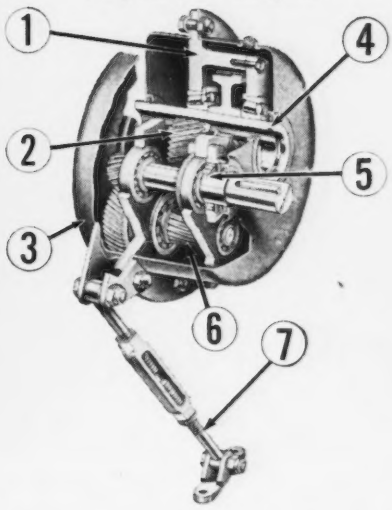


Sturtevant Dry-Batch Mixer for mixing materials into a homogeneous mass. 5 models: ¼ to 2 tons.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.
Designers and Manufacturers of **CRUSHERS · GRINDERS · SEPARATORS · CONVEYORS**
MECHANICAL DENS and EXCAVATORS · ELEVATORS · MIXERS



These famous FALK "In-built" factors *mean long life and dependability...*



SIX SIZES

- 1/2 to 30 hp
- Single or double reduction
- Wide output speed range—420 to 10 rpm

FALK

ALL-STEEL

Shaft Mounted Drives—

simple-compact-rugged-efficient

Created specifically for the vast number of applications demanding a sturdy and compact speed-reducing unit for direct mounting on the driven shaft, the new Falk all-steel Shaft Mounted Drive is built to give long service life at substantial savings of space, time, power and maintenance costs!

This efficient helical-gear drive, latest in the unmatched list of Falk precision-gearing achievements is an ingenious modification of the time-tested Falk Motoreducer design which has held, for more than 20 years, recognized leadership in this branch of highest-quality power transmission . . . It complements and completes the world-famous Falk line of reduction units covering the entire range of industrial applications.

Investigate the Falk all-steel Shaft Mounted Drive. Write to Department 247 for engineering bulletin, including selection and dimension details.

1 All-steel Frame, with more than double the rigidity of iron, supports all rotating elements.

2 Precision Helical Gears, designed and machined by Falk, rated to AGMA standards.

3 Pressed Steel Housings, whose sole function is to keep oil in, dirt out; easily removed for gear inspection without dismounting unit.

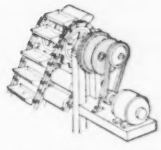
4 Through Hollow Shaft with counter bore provides for easiest installation or removal from driven machine shaft extensions.

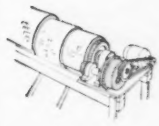
5 Backstop can be furnished with the unit or added later for positive prevention of reverse rotation.

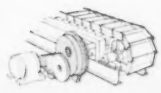
6 Positive Lubrication, continuous direct dip of revolving elements at all speeds.

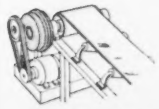
7 Tie Rod and turnbuckle serve as anchor and facilitate V-belt or chain adjustment.

A FEW TYPICAL APPLICATIONS


BUCKET ELEVATOR


SAND CLASSIFIER


APRON FEEDER


BELT CONVEYOR

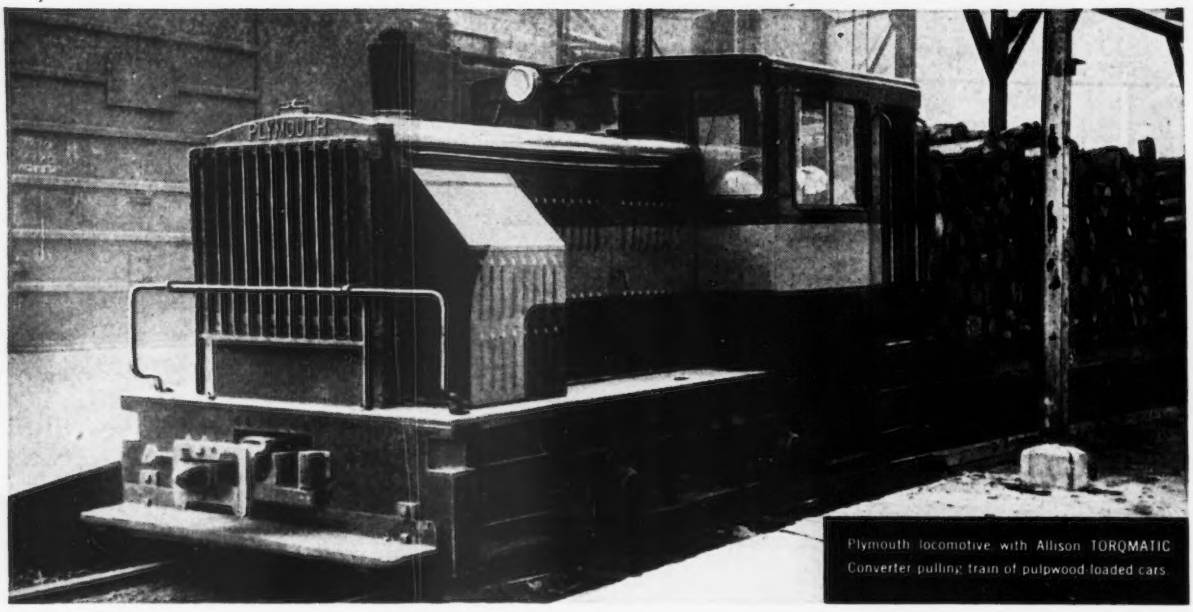
THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

. . . a good name in industry



Plymouth locomotive with Allison TORQMATIC Converter pulling train of pulpwood-loaded cars.

Shock-Free Power Transmission Saves $500 a month

PRODUCTION jumped almost 100% when, in December 1950, *one* 18-ton locomotive equipped with an Allison Torque Converter replaced *two* 12-ton trolley-type locomotives owned by West Virginia Pulp and Paper Company.

Immediate savings came to $500 a month — the cost of a locomotive coupler. The trolley-type locomotives damaged an average of one coupler each month but smooth power transmission by the Allison TORQMATIC Converter eliminated this replacement expense.

And by November 1953, *savings in couplers alone* paid for a second Allison TORQMATIC-equipped locomotive.

Maintenance on these two units is "practically nil" because the Allison Converter automatically matches engine power to load demand, prevents engine lugging and drive-line shocks. Each unit uses less than 1 gallon of Diesel fuel an hour, pulls trains up 4½% grades, works an average of 16 hours per day.

Savings on Other Types of Heavy-Duty Equipment

Allison TORQMATIC Converters and TORQMATIC DRIVES cut costs and boost production in a wide range of heavy-duty equipment.

An Arizona mine gets 41% longer tire life on big truck tires costing $1000 or more each.

A Pennsylvania dragline operator saves $2160 a year on cable alone.

A western contractor gets 100% longer transmission life on off-highway trucks.

Get full details on TORQMATIC Converters, DRIVES and BRAKES for your units from your equipment dealer, manufacturer or write direct.

Allison Division of General Motors
Box 894M, Indianapolis 6, Indiana

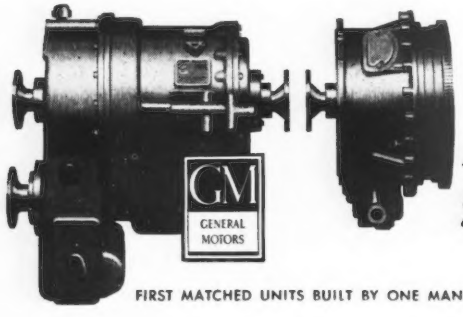
ALLISON TORQMATIC CONVERTER

Simple Design — one-piece cast converter elements — minimum maintenance

Compactness simplifies installation

Designed for power application in the 40 to 400 h.p. range

Longer Equipment Life — absorbs shock, eliminates engine lugging, cuts maintenance cost.



FIRST MATCHED UNITS BUILT BY ONE MANUFACTURER

Allison
TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES
TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS

The loader operator is also the motorman in this operation. Results — high production per man shift.

LOW COST PRODUCTION

Tonnage loaded into cars for transporting to the surface is the tonnage measured for mine production.

Dependable loading equipment and efficient loading methods are more responsible than any other factor in keeping production up.

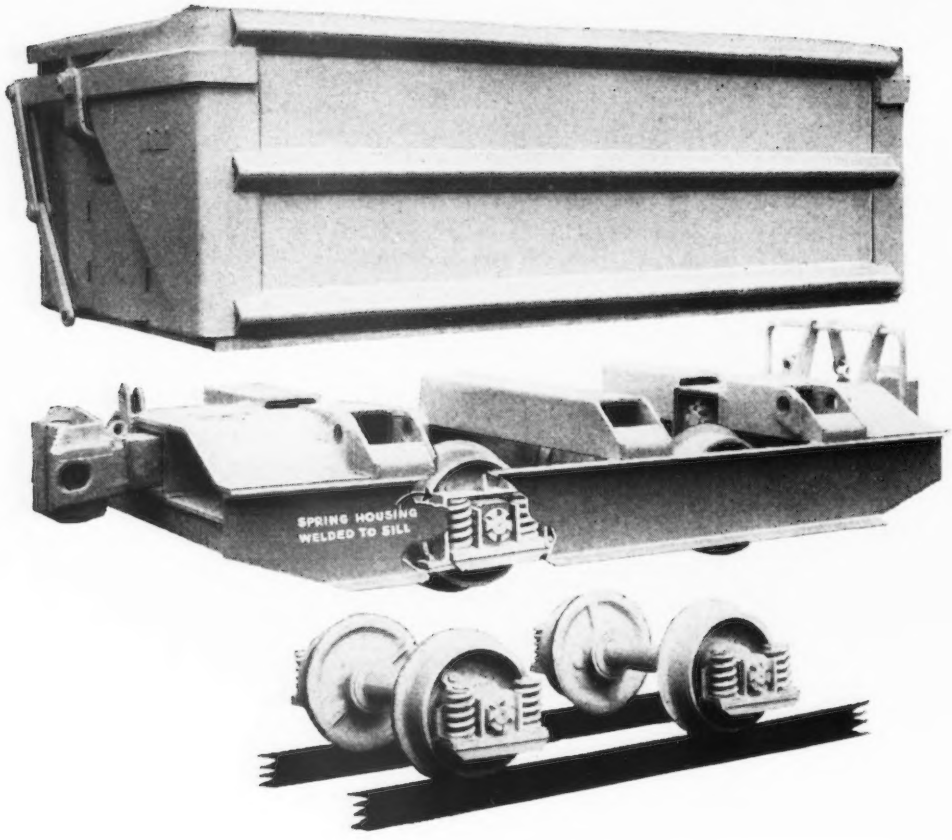
Eimco loaders in conjunction with drawpoint mining systems, have in many cases been found to be the most productive method on a tons-per-man shift basis. These facts are explained in recent papers by operators who have used chute and grizzly systems and scram drift scraper systems as well as combinations of both.

Write for your copy of these papers and information on drawpoint production loading with Eimcos. These will be your guides to greater tonnages at lower costs.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy



SANFORD-DAY'S NEW

Here's the story on the advantages of an important

You will be interested in this complete information on the more important advantages of the new Granby Car recently announced by Sanford-Day—a car so designed and constructed to give many years of trouble-free service under extreme shock loading conditions.

OUTSIDE FRAME UNDERCARRIAGE:

1. Rigid undercarriage and full width support of body as a result of frame being tied together with full width transverse, box type members.
2. Greater capacity for any specified dimensions because body hinge points are located outside of wheels, allowing lowest possible bottom.
3. Better trackability on narrow gauges because the low bottom and wide frame give a low center of gravity.
4. Extra rugged hold-down, when needed, utilizing the outside frame.

OUTSIDE SPRING TRUCK BOXINGS:

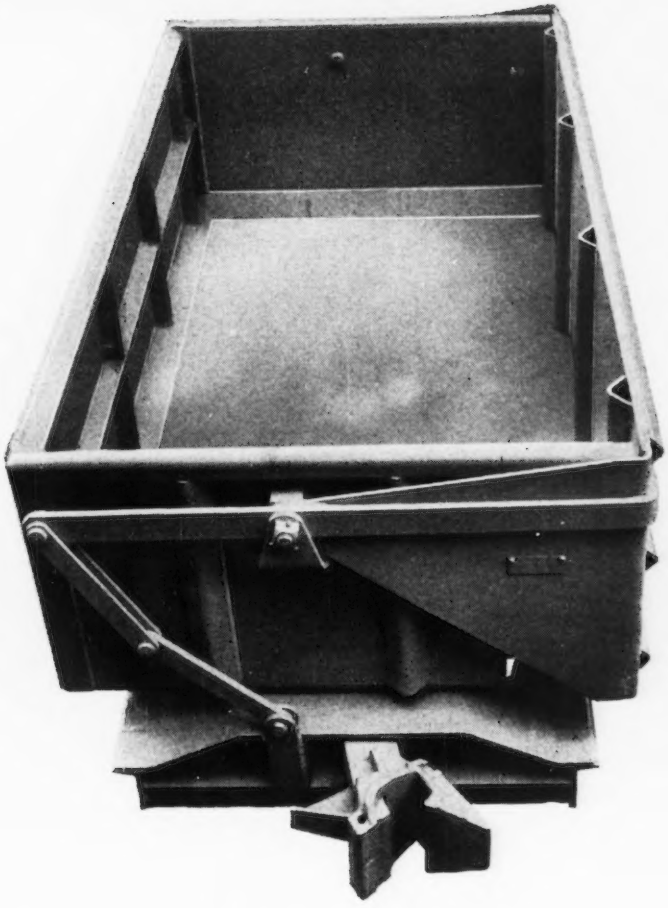
1. Easy access to all parts of truck and boxing for maintenance. By removal of eight small bolts the entire axle, wheels, boxings and spring assembly may be dropped out of frame.
2. Maximum shock absorption for any shock or load condition. All four wheels are in constant contact with rails because of two large outer coil springs and two inter coil springs at each wheel.
3. No pinching of bearings caused by side thrusts loosening shrunk on collar. Any side thrust is transmitted from the frame through the wheel assembly and axle to opposite dust collar, which is abutted against a shoulder on the axle.

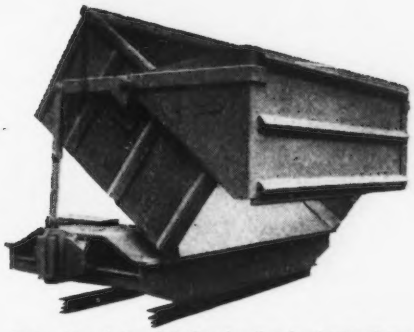
AUTOMATIC COUPLING MOUNTING:

1. No weak spots because coupler housing is so ruggedly fitted into the frame members that all shock is transmitted directly to the frame.
2. Easy removal of the couplers for repairs or inspection because of the box type coupler housing design.

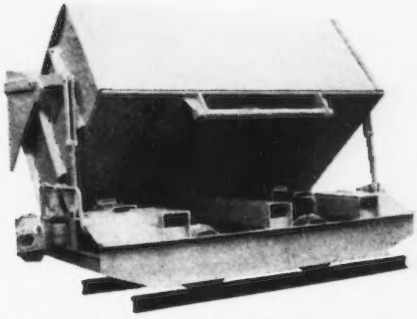
MAXIMUM-STRENGTH BODY:

1. Heavy ¾" bottom plate, instead of the light conventional plates used in most designs, gives longer life and lower maintenance against abrasive shock loading.
2. Car does not require exact spotting for lifting if dumped by air cylinder because ¾" bottom plate affords





Gate side of the S-D Granby Car is shown above with body in dumping position and gate open. The rear view of car when in dumping position is shown below. (Note this car is dumped by air cylinder, but wheel dumping may be used.)



Note in photo at left the inside construction of this new car featuring valley angles, inside vertical stiffeners on gate side and inside vertical and longitudinal braces on solid side. This particular car was built for a 24" track gauge. The level full capacity is 80 cubic feet. Length inside car body is approximately 9 feet. Width inside is approximately 5½ feet. The size and capacity of this car can, of course, be varied to suit your conditions.

GRANBY CAR . . .

new car for the metal mining industry

rigidity to body lifting means. (Dumping wheel may be added if desired).

3. Braces run vertically and longitudinally on inside of solid side of car for maximum strength and maximum capacity.

4. Inside stiffeners run vertically on inside of gate side of car for clean shedding and outside longitudinal stiffeners insure maximum strength.

5. Valley angles on inside of car, at ends and solid side, also provide better shedding and added body strength.

6. Vertical gussets on outside of ends of car body provide additional strength.

7. Sealing strip is welded to car bottom on gate side.

8. Heat treated pins are used in gate mechanism.

THE GENERAL S-D GRANBY DESIGN:

1. All welded design in which each member is made to serve one or more purposes.

2. Material is utilized in the most economical manner, giving ruggedness with simplicity.

3. All joints and connections have been designed and welded in accordance with the standards set by the American Welding Society Codes. In addition, joints or splices are designed to equal parent metal strength with an ample safety margin. The welding technique employed utilizes the most modern equipment, material and technique available in the world today.

We can truthfully say that no mechanical structure is put together with more skill, better equipment or more modern methods than this new Sanford-Day Granby Car. It is the answer to your demands for longer car life and the lowest possible repair and maintenance costs. We would like to send you complete specifications. Just drop us a line. Regardless of the type car you need, we build it . . . and you will discover that an investment in Sanford-Day built cars will be money well spent.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

BROWN-FAYRO DIVISION
JOHNSTOWN, PA.

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
PUMPS - OIL SPRAY SYSTEMS

Crucible Hollow Drill Rods being used in excavation for new Socony-Vacuum Bldg. Owner: Galbreath Co. General Contractor: Turner Construction Company.

they're using

CRUCIBLE HOLLOW DRILL RODS

on the Socony-Vacuum Building job

Across the street from New York City's Chrysler Building, the Slattery Contracting Company is busy moving a city block of earth and hard rock. They're preparing the way for construction of the new 42-story Socony-Vacuum office building.

It's another tough job on which thousands of tons of rock must be moved... and since Crucible Hollow Drill Rods are *first choice* for tough jobs, you'll find them being used extensively on this one. Construction men *know from experience* they can rely on Crucible Hollow Drill Rods for top performance.

That's because Crucible makes its hollow drill rods to *tool steel* standards. That means you'll have fewer broken rods, greater operating efficiency... *lower cost per foot of hole drilled*... when you specify Crucible Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

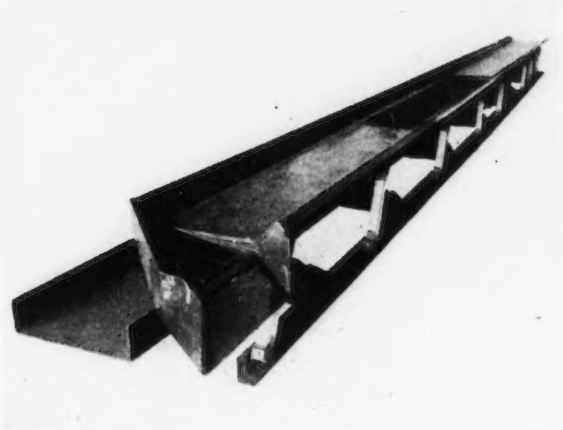
54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

E&MJ NEW PRODUCTS DIGEST

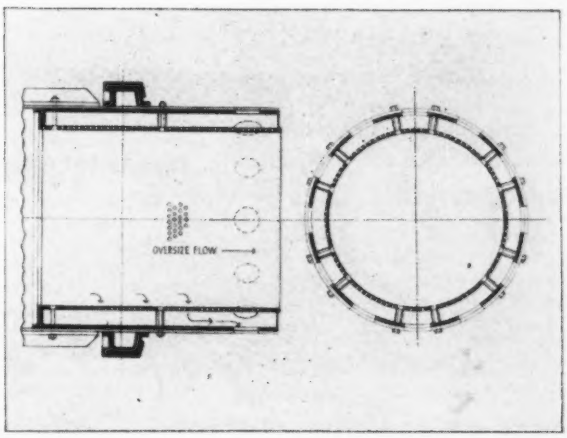


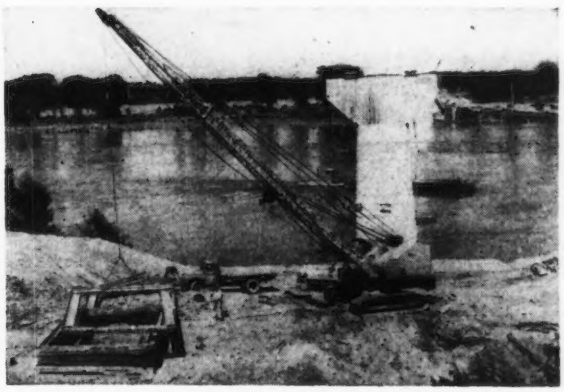
NATURAL FREQUENCY CONVEYOR

For handling materials that are hot, sharp, sticky, with a minimum of spillage, low maintenance costs and high efficiency, Carrier Conveyor Corp., Louisville, Ky., offers the natural frequency conveyor. Taking advantage of the natural resonance in coil springs, the unit is claimed to require very little power. The 40-ft conveyor above with ⅜-in pan has a capacity of 100 tph and is powered by a 5-hp motor. Note grizzley section for screening and separation with side dump for separated materials, and end dump for remainder. (1)

DREDGE TROMMEL

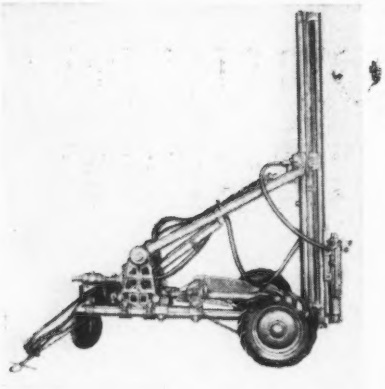
By making use of an internal perforated area and mounts inside the area usually blanked out by circular tread rings and blank end plates, Yuba Mfg. Co., San Francisco, Calif., claims that this dredge trommel increases effective screen area by 25% without lengthening the screen. (2)





EXCAVATOR

Relatively small and easily handled, the Koehring 405 excavator has a high (20-ton) lift capacity. Shovel and hoe attachments are designed for one cubic yard. Clamshell and dragline buckets depend on weight of material to be lifted. Koehring Co., Milwaukee, Wisc. (3)

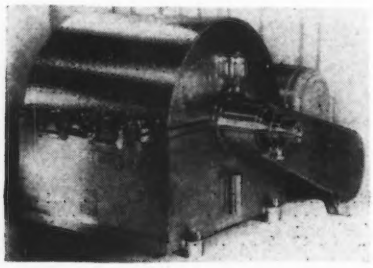


SELF-PROPELLED WAGON DRILL

Addition of an air motor has made the Cleveland DR-30 wagon drill a self-propelled unit with chain drive. Drill unit has air feed with 8-ft travel for 6-ft steel changes. Cleveland Rock Drill Div., Le Roi Co., Cleveland, Ohio. **(4)**

STEEL CONVEYOR PULLEYS

American Pulley Co., Philadelphia, Pa., has a complete new line of Type HD steel conveyor pulleys with interchangeable split tapered hubs. The hubs, says the maker, squeeze the shaft so tightly when drawn into the pulley end-disc, that possibility of pulleys "walking" is eliminated. **(5)**



CENTRIFUGAL CLARIFIER

This machine will do in one pass what might otherwise require a battery of tanks and up to 15 washing steps, plus centrifugal clarification of the effluent stream, according to a release from the National Chemical Exposition. The machine is called the Podbielniak centrifugal co-current and counter-current liquid-liquid contactor and clarifier. It does its work with a centrifugal force up to 5000 times gravity. It's pressure-tight to 200 psi and handles up to 20,000 gph. Podbielniak, Inc., Chicago, Ill. **(6)**

FAULTFINDER

A portable ground detector and fault locator for use on energized power lines, the Brunt Faultfinder is now available in universal Model #54. Using a voltage selector switch, this instrument may be used on power voltages of 120, 240, 480 or 550 ac or ungrounded dc. Parr Mfg. Corp. **(7)**

SPHEREFLEX GEAR COUPLING

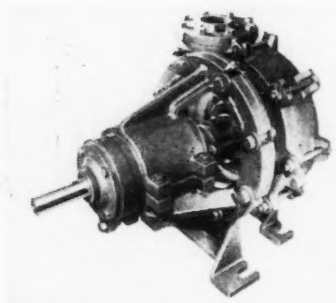
As the name implies, male teeth of each coupling are cut on a true spherical arc while the internal teeth are cut with a straight root. When misalignment occurs, the curved tooth maintains a constant area of contact with the internal tooth. No longer is coupling flexibility dependent upon excessive backlash between coupling teeth, point contact or springs. Full details are available from Philadelphia Gear Works, Philadelphia, Pa. **(8)**

ELECTRONIC SCALE

An electronic highway scale which weighs and records both single and dual axle truck weights while vehicles are in motion, has been developed by Cox and Stevens Aircraft Corp., Mineola, N. Y. Weighing platform is 3 ft by 10 ft. **(9)**

RUST CONVERTER

FerRoSeal, a liquid which chemically converts rust into a protective iron phosphate coating is available from Municipal Steel Corp., New York, N. Y. Coating requires only wire brushing to make it a good base for paint or other coatings; better than bright steel, says Municipal Steel. **(10)**

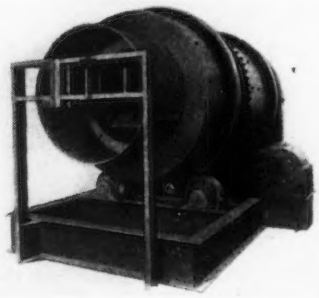


RUBBER LINED PUMP

Pumps designed for handling abrasive, fine-mesh material (minus ⅛ in. to 325 mesh) like sand, taconite, grinding mill discharge, tailings, silicon carbide, aluminum oxide, slimes, slurries, are available in open or closed impeller models at capacities from 10 to 3000 gpm, at heads through 140 ft. Allis-Chalmers Mfg. Co., Milwaukee, Wisc. **(11)**

END DUMP TRUCK

Latest of a series of new model off-highway end dump trucks recently announced by the Dart Truck Co., Kansas City, Mo. is a 20-ton capacity truck. The high degree of maneuverability claimed is due to its short 120-in. wheelbase and high horsepower. Hydraulic steering whips the truck around a circle with 21-ft radius. The truck is powered by a diesel engine, 225 or 275 hp (optional) and is available with conventional transmission or torque converter. **(12)**

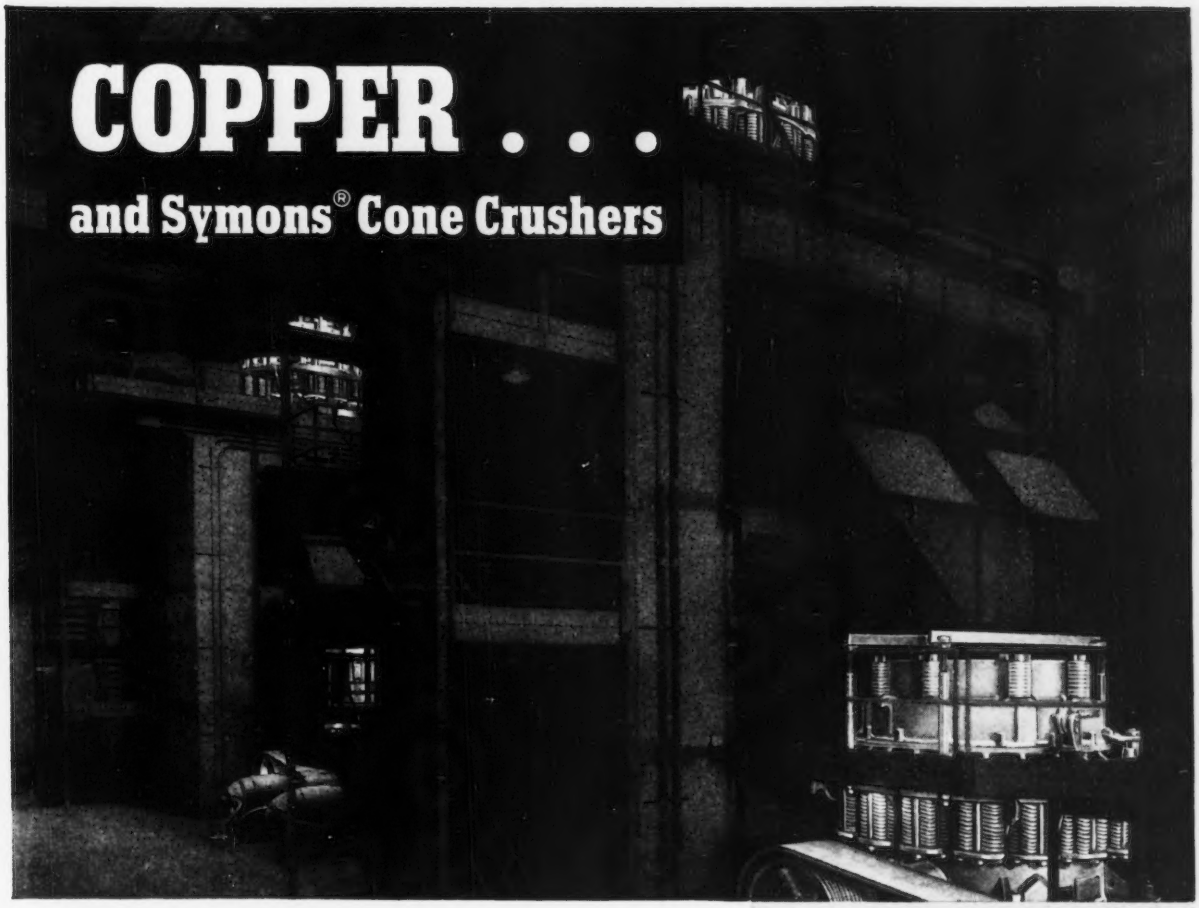


SCRUBBER

McLanahan Hi-Speed scrubber, designed primarily for the removal of loam, light clays and soft materials from aggregates, should be of interest to uranium miners as a tool for upgrading carnotite ores. Scrubber is revolved by removable steel tires running on trunnion rollers.

COPPER . . .

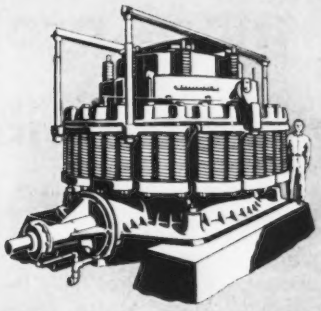
and Symons® Cone Crushers



COPPER...and Symons® Cone Crushers

Symons Cone Crushers . . . the *machines that revolutionized crusher practice . . .* have long proved their efficiency, dependability and economy in the profitable reduction of ores and minerals the world over. In the case of COPPER, it is significant that more than 90% of the world's production passes through Symons Cone Crushers. Throughout the entire COPPER industry, the new and repeat orders for these crushers are continued evidence of the satisfaction given in fine reduction crushing service. The outstanding performance of Symons Cones in delivering a finely crushed product in greater capacities and at lower cost makes them the leading choice of the world s outstanding mining companies.

NORDBERG MFG. CO., Milwaukee, Wisconsin C554-R



Symons Cone Crushers are built in Standard, Short-head and Intermediate types with crushing heads from 22" to 7' in diameter — in capacities from 6 to 900 tons per hour.

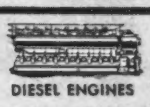
SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD.

SYMONS PRIMARY CRUSHERS

GRINDING MILLS

MINE HOISTS

SYMONS VIBRATING GRIZZLIES and SCREENS



DIESEL ENGINES

NORDBERG MACHINERY

NORDBERG

ORE FINERS SYMONS SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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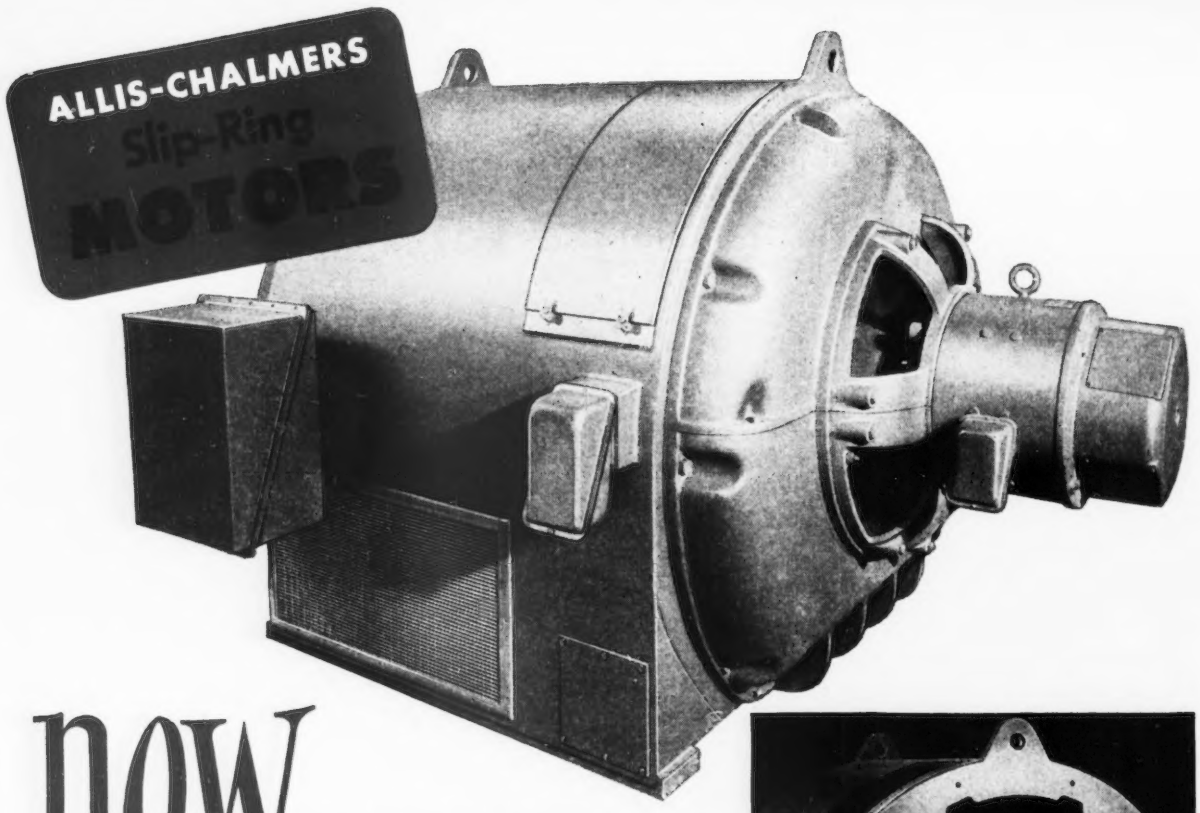
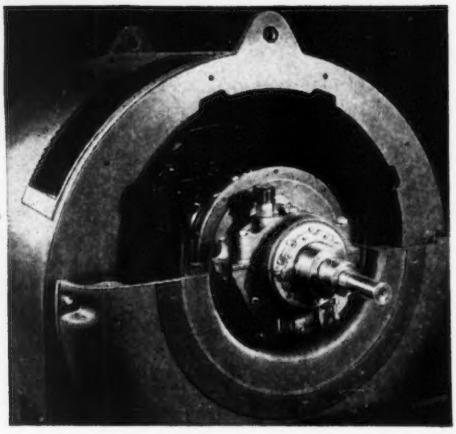


new DESIGN...

more protection with full accessibility



* New Allis-Chalmers slip-ring motor with inspection cover and upper half of end shield removed. Note accessibility of brushes, protection of bearing.

ALLIS-CHALMERS LARGE SIZE SYNCHRONOUS AND WOUND-ROTOR MOTORS have been completely redesigned with longer stator yokes and shorter end shields. Collectors and brushes are located inside the yoke for protection against physical damage, dripping moisture, dust and dirt.

Capsule-type bearings give better bearing protection, too. The upper half of the end shield may be removed for inspection or cleaning of the interior of the motor without disturbing the exciter or exposing the bearing to the ravages of dirt, dust and oil contamination.

All leads enclosed — Both primary and secondary winding leads are brought out through separate conduit boxes. There is no loose wiring . . . no exposed leads anywhere.

Easy maintenance — Even though the new design offers maximum protection to brushes and collectors, internal parts are fully accessible for inspection and maintenance through large openings in the stator yoke. Opening covers are readily removed and are secured during operation by easy-operating, self-locking fasteners.

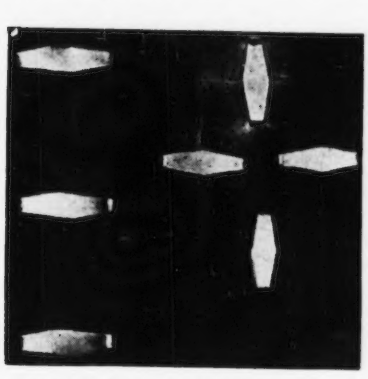
Get details now — This new design is available from approximately 250 hp at 300 rpm and up, in drip-proof and splash-proof construction. Call your Allis-Chalmers representative for complete details or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183. A-4464

ALLIS-CHALMERS

Power is transmitted by roller chain from a 100-hp gear motor. McLanahan & stone Corp., Holidaysburg, Pa. **(13)**

URANIUM DETECTOR

The Bismuth Nucliometer, Model 390-B, with bismuth counter tubes, is one of the most sensitive portable radiation detectors made, according to the manufacturer, Detectron Corp., North Hollywood, Calif. Radiation measuring only 0.005 mr/hr. will give full scale reading. Useful for airborne surveys, grid map work and oil survey work. **(14)**

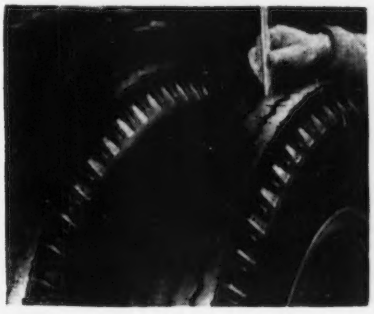


CONVEYOR BELT REPAIR

On-the-job repairs of ripped conveyor belts are possible in a few minutes with low cost Clip-A-Rip. Can also be used for inserting a patch as shown above. Three Point Belt Lacing Co., Peace Dale, R. I. **(15)**

NEW ACID and PLATING HOSE

Hose designed to handle hot acids and all plating solutions now is available for shipment out of stock in sizes of 1, 1½, 2 and 2½ in.ID. Larger sizes can be provided if needed, on reasonable delivery schedules. This hose is designated as Camac acid and plating hose and is constructed of Butyl rubber with 4-ply reinforcing. It is said to stand up under all hot acids except nitric or chromic and does not contaminate plating solutions. Carl Buck & Associates, Essex Fells, N.J. **(16)**



COOL TIRE

They're proud of their new heavy-duty truck tire at Dunlop Tire & Rubber Corp., Buffalo. Mileage claims to have been extended at least one-third beyond that of existing top-grade tires. Major improvements, they say, have been accomplished in three areas: the tire runs perceptibly cooler than earlier designs because its mold shape minimizes destructive internal friction; it uses a newly developed rayon cord which is the strongest available, and it combines a new and superior carbon black with the highest grade natural tread stock the manufacturer can produce. **(17)**

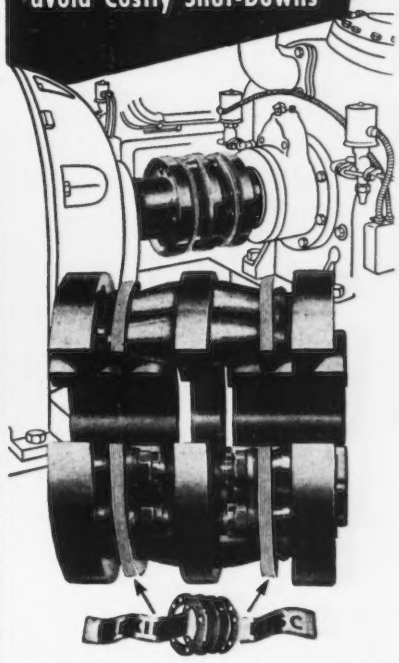
TRANSIT CRANE

The 15-B transit crane, mobile crane-excavator with 15-ton rated lifting capacity, made by Bucyrus-Erie Co., South Milwaukee, Wis., is designed to handle fast and efficiently the many types of work now considered too small or restricted for profitable large-machine operation. Mounting is powered by a 128 hp White gasoline engine. Standard crane boom is 30 ft long, extensible to 70 ft by using removable inserts. The 15-B transit crane is readily convertible to ½-cu yd shovel, dragshovel, clamshell and dragline front ends. **(18)**

NEW SHOES

Crawler tractor owners using their machines on rock and other hard surfaces with resultant heavy wear, now may purchase double grouser track shoes

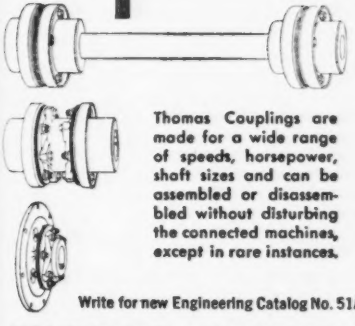
Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



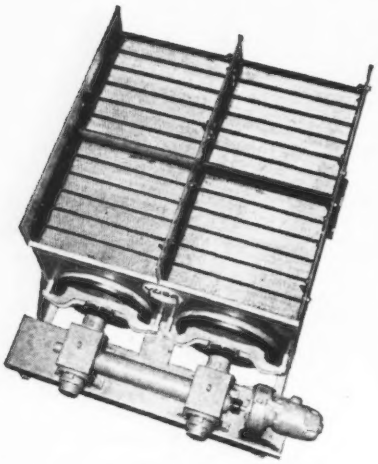
Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

YUBA JIGS

for mills and dredges



Handle any material that can be concentrated, such as

CASSITERITE	RUTILE
GOLD	SCHEELITE
PLATINUM, ETC.	GARNETS
MONAZITE	SAPPHIRES
ZIRCONIUM	IRON
ILMENITE	COPPER

YUBA jig action is positive. Just set to desired speed and stroke, get constant uniform pulsations that create surface action over full area of jig bed. Result: YUBA M-8 jigs have large material capacity per flow line under full control.

Stroke adjustments between ¼" minimum and 3" maximum are easily and quickly made. Maximum frequency of a 4 cell M-8 jig is 350 at ¼".

YUBA jig design saves space, increases production in new or old dredges or mills. Use to supplement existing jigs or replace other concentration methods. For details of adapting YUBA jigs to your operation, send us data on ore, feed sizes and present installation.

YUBA DREDGES — PROVED DEPENDABILITY AROUND THE WORLD

75

YUBA MANUFACTURING CO.

Room 706 • 351 California St. • San Francisco 4, Calif.

E&MJ NEW PRODUCTS DIGEST

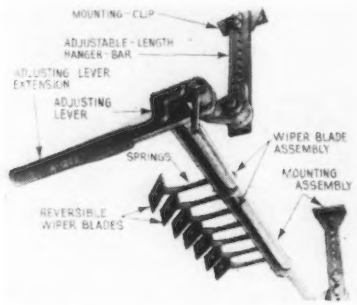
for Caterpillar D8 tractors, designed for greater resistance to bending, something in the order of 300% or more. Caterpillar Tractor Co., Peoria, Ill. **(19)**

SWITCHGEAR BATTERIES

Stationary batteries, specifically designed for use in switchgear, control, and auxiliary power applications have been announced by C&D Batteries, Inc., Conshohocken, Pa. Compromise construction needed in batteries that cover wider range of services has been avoided. PlastiCell (for full float operation) and PlastiCal (lead calcium grids) lines are available in capacities from 10 to 770 amp hr. **(20)**

LEAK-PROOF COUPLING

Titeflex, Inc., Springfield, Mass., announces that its quick-seal, leak-proof coupling is now available in heavy duty models for high pressure, heavy flow applications. Features simple construction and full swiveling to prevent hose kinks. **(21)**



CONVEYOR BELT CLEANER

This conveyor belt cleaner is designed to remove material adhering to belt after discharge. Lengthens belt life by preventing cover wear. Pressure on spring-mounted blades can be adjusted for different operating conditions. Stephens-Adamson Mfg. Co., Aurora, Ill. **(22)**

PORTABLE URANIUM ANALYSIS LABORATORY

Portable laboratory gives fast, on-the-spot analysis of samples for uranium. Requires no chemical or mathematical training on the part of the user and is entirely self-contained. Analysis can be done in 30 min and uses about 75c worth of materials. Comes in compact, rugged carrying case. Sherwin Instrument Co., New York, N. Y. **(23)**

END-DUMP WAGON

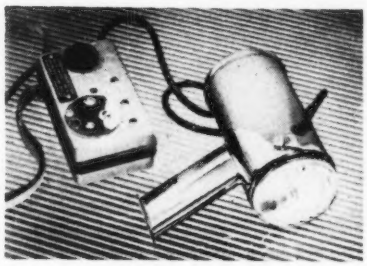
Known as the Sierra Movall, a cable-operated, end-dump rock and dirt wagon is now in production by C&D Mfg. Co., Perkins, Calif. Interchangeable goosenecks make wagon quickly adaptable for use with DW20 or DW21 tractor. Capacity is 25 cu yd heaped, with a maximum of 31 tons. **(24)**

DRIVE WHEEL FRICTION

High maintenance costs on shuttle cars, according to Lee-Norse Co., Charleroi, Pa., comes mostly from breakage and damage to wheel units and parts like gearing, bearings, drive shafts, etc. The use of the Lee-Norse Drive Wheel Friction will help reduce this high maintenance cost by limiting the loads and shocks of all these wheel parts to what they can take without breaking, and still get maximum power to each wheel. **(25)**

LIQUID ZINC

Manufacturer claims that Zinktron offers all the advantages of hot dip galvanizing with none of the expense. It is applied with paint brush or spray gun and takes only an hour to dry. A gallon covers 450 sq ft. Constad Laboratories, New York, N. Y., is the manufacturer of Zinktron. **(26)**



GAMA-BETA SURVEY UNIT

"An exceptionally sensitive Gama-Beta radiation survey meter" is how Jordan Electronic Mfg. Co., Inc., Pasadena, Calif., bills this tool for prospectors. Use of ionization chamber construction permits detection of radiation changes as small as 0.002 mr/hr near background levels. High voltage batteries, vibrator or rectifier supplies, high-meg resistors, and electron tubes to amplify chamber output have been eliminated to make these instruments serviceable under all field conditions. **(27)**

7 pounds, 6 oz.–rarin' to go!

How much weight to a horsepower? Take one of our P&H Diesels — divide its weight by its power — and that's the figure you get.

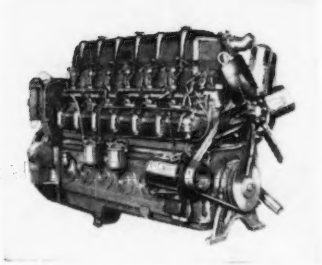
The reason we're so proud of our baby: at 7 pounds, 6 ounces this horse is full grown! No competing diesel can produce a full horsepower to that amount of weight. Pound for pound, this engine out-powers them all.

Dollar for dollar, too. A P&H will give you more horsepower per dollar than any other diesel. And just as a sort of extra, it's also the easiest to service!

Not that it will need much servicing. Actually, a P&H Diesel takes less of it than the old gasoline engine. Its fuel cost: *about one-third.*

Some baby!

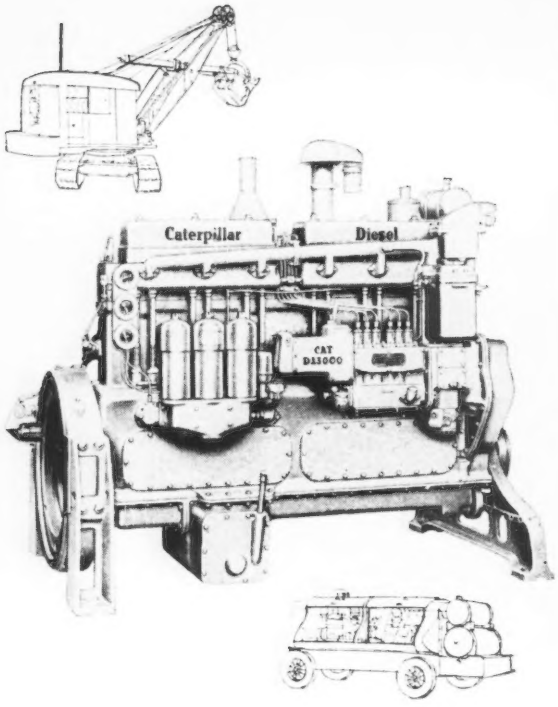
P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.



Horsepowers, 30 to 255. Two-cycle. 2, 3, 4, 6-cylinder models. Speeds to 1800 rpm. Stationary, mobile, marine. Diesel-generator sets

THE P&H DIESEL

lowest price per horsepower . . .
lowest weight per horsepower



Announcing the

NEW 190-HP CAT* D13000 ENGINE

CATERPILLAR ADVANCED DESIGN FEATURES IN THE NEW D13000

While retaining such time-proved features as aluminum alloy main and connecting rod bearings, "Hi-Electro" hardened and Superfinished bearing surfaces, exclusive Caterpillar fuel injection system, ability to use low-cost No. 2 furnace oil without fouling, etc., the new D13000 incorporates many new features, among them:

NEW Valves, Inserts, Rotators—new components, standard in the breathing system, combine increased breathing ability with longer valve life—make possible additional horsepower output and lower maintenance costs.

NEW Vibration Damper—sturdy, metal-enclosed, fastened directly to front of crankshaft. Keeps unit vibration-free at higher speeds. Optional in installations where engine speed is kept below 1000 r.p.m.

NEW Camshaft—improved high lift cam profiles give smooth valve seating and increased breathing ability. This increased capacity, also made possible by new oil-bath air cleaner and larger intake and exhaust manifolds, insures low exhaust temperatures and adequate reserve power.

NEW Water Pump—larger, with a greatly increased capacity to answer cooling needs of this modern, high-powered diesel.

NEW Pistons—oil-cooled, made of high-strength, lightweight aluminum alloy with stainless-steel heat plugs in the high-temperature zone and cast-in iron bands for the top ring groove to give best service at lowest final cost.

NEW Oil Pump—features not just one, but two pressure controls to assure correct lubrication for all moving parts from the first turn of the crankshaft.

For complete details, specifications, attachments, etc., see your nearby Caterpillar Dealer

...yours for greater power, production, profits!

For years, working in all kinds of construction equipment, conditions and jobs, the Caterpillar D13000 Engine has proved itself a big money-maker for power users. Now, here's a new D13000, designed and built to bring you even greater power, production and profits!

In the new D13000, you get 21% more brake horsepower. Its governed speed, raised to 1200 r.p.m., provides greater versatility and productive capacity. While keeping outstanding, time-tested parts, it adds advanced design features to set new standards of stamina, dependability, economy and long life. And its wide variety of matched accessories and attachments makes it readily adaptable for any need.

For jobs requiring power in the 145 (continuous) to 190 (intermittent) horsepower range, your best buy is this rugged new Cat D13000 Engine. Leading manufacturers of excavators, crushers, compressors and other heavy-duty machinery can furnish it in their equipment. Get the *complete* facts about it today from your nearby Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

D13000—
A NEW STANDARD
OF DIESEL POWER

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

PNEUMATIC HANDLING. Of value to chief executives, engineers, and purchasing agents in industries which handle dry pulverized materials, is a new 16-page, two-color bulletin on bulk pneumatic handling. Offered by the Fuller Co., Catasauqua, Pa., and entitled "How to Pull Dollars Out of Thin Air," the bulletin tells how handling costs can be reduced substantially by using the proper pneumatic handling system. Also covered are the Fuller rotary compressor, the clinker cooler, and the new kiln preheater. **(51)**

FIRE HOSE. A catalog in color, covering the Boston line of industrial fire hose and fittings, is announced by the Boston Woven Hose & Rubber Co., Boston, Mass. **(52)**

INDUSTRIAL ENGINES. Brochure describes Power Giant industrial engines, Model L-4 "Jeep" and Model F-4 "Hurricane." Complete engine details are given both for the L and F head designs including power, torque and fuel curves at various rmp; special features; installation diagrams; and other general descriptive material. This 6-page brochure can be obtained from the Industrial Engine Department, Willys Motors, Inc., Toledo, Ohio. **(53)**

BULK LOADER. Stephens-Adamson Mfg. Co., Aurora, Ill. offers Bulletin 854 covering their line of fixed and portable "Swiveloaders" for loading or storing bulk materials. The new "Hi-Type "Swiveloader", designed for loading over grain doors of box cars at capacities up to 150 tph, is featured along with the standard "Swiveloader" and a portable unit known as the "Swivelpiler." **(54)**

SOIL SAMPLING RIGS. Acker Drill Co., Scranton, Pa., has available Bulletin #28 which describes their line of portable powered soil sampling rigs known as Models RGT and RG. Both models feature a powerful hoisting winch for jetting and driving pipe and/or piles. A lever controlled positive displacement pump is also included on either model. Power plant can be either gasoline, kerosene, diesel, electric or air motor or direct power take-off from a motor truck. **(55)**

ROAD SWEEPERS. This 4-page Bulletin MS-250 describes and illustrates in detail uses, advantages, operational information and specifications of the complete line of Homer magnetic hand and road sweepers to remove tramp iron and other magnetic materials wherever it presents a hazard to rubber tired vehicles or plant personnel. Homer Mfg. Co., Inc., Lima, Ohio. **(56)**

ELECTRIC MOTORS. Multi-color Booklet 1878 illustrating the 20 principal types of improved U.S. motors has just come off the press. U.S. Electrical Motors, Inc., Los Angeles, Calif. **(57)**

RESEARCH. Techniques for conducting research throughout the world are summarized in a colorful 8-page brochure published by Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill. Describes services, personnel, and operations of the Foundation's international department which performs technological audits, establishes industries research centers, assists in setting up new industries, makes natural resource studies, develops uses for by-products, and trains local technical personnel. **(58)**

COMPRESSOR. Two-page bulletin has just become available on the Le Roi 105 cfm utility air compressor. Specifications for the compressor and engine and a complete rundown on tool capacities are included. Le Roi Co., Milwaukee, Wis. **(59)**

AUTOMATION. "Tools of Automation," a 12-page booklet issued by Reliance Electric and Engineering Co., Cleveland, Ohio, expresses the company's philosophy of combining applied engineering, creative thinking, and electric motor drives to provide the "know-how" for automation of single machines or continuous processes. Many illustrations and sketches accompany each section. **(60)**

GRINDING WHEELS. Catalog No. 1233, containing a comprehensive assortment of standard sizes of diamond grinding wheels and hones has just been published by Norton Co., Worcester, Mass. Included in the tables of this 52-page booklet is the net price to the customer of each item listed, in various ordering quantities. Also includes information on diamond wheel markings, selection of wheels, standard shapes of wheels, and suggestions on the use of diamond wheels and hones. **(61)**

ANTI-CORROSION PACKING. "Chempac Packing & Gaskets" is the 6-page illustrated folder just issued by Johns-Manville, New York, N.Y. These various Chempac materials, which are virtually unaffected by corrosive chemicals and active solvents, are made of asbestos treated with Teflon, (Dupont's terafluoroethylene resin). They are especially designed for chemical and process equipment. **(66)**

STORAGE BINS. This 29-sheet technical brochure on concrete stave storage bins contains table of cubic foot weights of flowable materials; bin capacities per foot of height; description of wall construction; information on Super-Concrete Stave with test data; detail drawings of stave, rods, and lugs; specifications and drawings of stave, rods, and lugs; specifications and drawings of concrete roof; photo of foundation curb on common-roof of adjacent bins for supporting superstructures; photos of access opening and trap door in roof; details of 45° elevator floor and overflow partition;

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after Dec. 1, 1954 if mailed in the U.S. or Canada.

OCTOBER 1954

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Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

My Name ..... Position .....

Company .....

Address .....

details of exterior safety ladder; details of wall openings including gates, frames, and chutes; photos of typical installations. Neff & Fry Co., Camden, Ohio. **(67)**

INDUSTRIAL PRODUCTS. American Brake Shoe Co., New York, N.Y. has published its first complete catalog. This 48-page, two-color book illustrated representative parts produced by eleven divisions of the company and details physical properties or characteristics where pertinent. Breakdown is by type of product; ferrous castings, non-ferrous castings, bearing materials, sintered metals, steel forgings, welding products, air compressors, industrial pumps, dredge pumps, and railroad products. **(68)**

ELECTRIC EQUIPMENT FOR PROCESS INDUSTRIES. Bulletin CED-1966A, "Electric Equipment for Process Industries," is available from the General Electric Co., Schenectady, N.Y. Provides detailed information on: G-E electrical equipment for power generation; power distribution and conversion; power utilization; instrumentation; descriptive publications; and G-E service shops and warehouses, applicable to the process industries. **(69)**

GROUTING. This 16-page folder describes successful grouting of heavy equipment with Embeco non-shrink mortar. Outlines and illustrates fully what Embeco is, some common methods of grouting different types of equipment, the mixing and placing of grout, cold and hot weather grouting and measurable characteristics of Embeco. Contains information on recommended mixes and estimating tables plus many illustrations of actual installations. Master Builders Co., Cleveland, Ohio **(70)**

REMOTE CONTROL WIRING. A completely revised up-to-date edition of General Electric's remote-control wiring manual has been announced by the company's Construction Materials Division, Bridgeport, Conn. Contains complete technical and installation data on modern low-voltage system of wiring. **(71)**

BINDING CHAIN. "Quick Facts About Chain," has data on chain for load binding and tie-down. Includes specifications and working loads limits for alloy steel chain especially manufactured for lifting purposes. Joseph T. Ryerson & Son, Inc., Chicago, Ill. **(72)**

GRAVITY METER. Lightweight Worden gravity meter is fully described in Bulletin GM-201, issued by Houston Technical Laboratories, a subsidiary of Texas Instruments Inc., Houston, Tex. Gravity meter, weighing only a fraction over 5 lb., has proved ideal for field use in all climes and terrains. **(73)**

WELDING ELECTRODES. Crucible Steel Company of America, Pittsburgh, Pa. has announced a 16-page data sheet, "Resistal (R) Stainless Steel Electrodes." A revision of a previously issued booklet, the new publication contains much additional information on welding stainless steels. **(74)**

CORE-DRILLING MACHINE. An 8-page, 2-color bulletin recently issued by Sprague & Henwood, Inc., Scranton, Pa., contains more information regarding this widely used high-speed heavy-duty diamond core drilling machine than has heretofore been available in type. Besides a detailed illustrated description of the model 142 machine, together with complete specifications and working data, this new bulletin lists the many items of accessory equipment required for successful diamond core drilling — all of which are carried in stock. **(75)**

VALVE CONTROL. Philadelphia Gear Works, Philadelphia, Pa., announces a 21-page catalog, L-54, fully describing "LimiTorque" valve operators. Illustrates and describes the latest LimiTorque SMA valve control for large or small valves, as well as showing operational details and illustrations. **(76)**

WELDING PRODUCTS. Condensed 52-page Catalog ADC 662B that describes and illustrates all of the Airco products regularly used by job shops, maintenance departments and other users of light welding and cutting equipment, is being offered by Air Reduction Sales Co., New York, N.Y. Covers Airco gases, welding and cutting equipment and accessories-torches, tips, regulators, electrodes, etc. It also includes three of Airco's latest developments—Aircospot (inert-gas spotwelding), Easyarc 12 electrode and the new heavy-duty cutting attachments for Airco torches. **(77)**

POWER TAKE-OFF. Bulletin No. 506, describing the performance of, and giving complete engineering data on Twin Disc disconnecting fluid power take-off Model 21 HUD-O, and Model 27 HUD-OO is available from Twin Disc Clutch Co., Racine, Wis. **(78)**

THICKENER. This 12-page Bulletin T5-B5 published by Denver Equipment Co., Denver, Colo., describes Denver spiral rake thickeners documented by data, drawings and photographs. Dimensions, specifications and capacities of steel, wood or concrete thickener tanks in sizes ranging from 3 to 80 ft are given. **(79)**

EXHAUST FANS. Fort Worth Steel and Machinery Co., Fort Worth, Tex. has available their new Industrial Exhaust Fan Catalog No. 500-B, featuring the S-2 exhaust fan, and descriptions of various applications, types and construction. Complete dimensional data and capacity tables to assist in application of fan. Principles of application and engineering data for standard and long-cone Cyclone Separators are described and illustrated. **(80)**

BULK HANDLING EQUIPMENT. This 32-page illustrated booklet, just published by Dravo Corp., Pittsburgh, Pa. discusses mechanical, electrical and structural features of such equipment as ore and coal bridges, man trolley unloaders, rope-operated towers, replacement trolleys, hydraulic buffers and rail clamps. **(81)**

SCINTILLATION COUNTER. A brochure descibing instrumentation for aerial or ground surveying for radioactive materials is available from the Nuclear Instrument and Chemical Corp., Chicago, Ill. Describes scintillation counting equipment and how it is used. **(82)**

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New-

ALLIS-CHALMERS

Rubber-Lined PUMP

for easier servicing when pumping abrasive, fine-mesh materials.

Loosening of nut allows man to remove both bolt and nut in a single quick motion.

Allis-Chalmers Rubber-Lined Pumps substantially reduce your maintenance, service and downtime costs. New design permits exceptionally fast takedown and reassembly without the use of special tools.

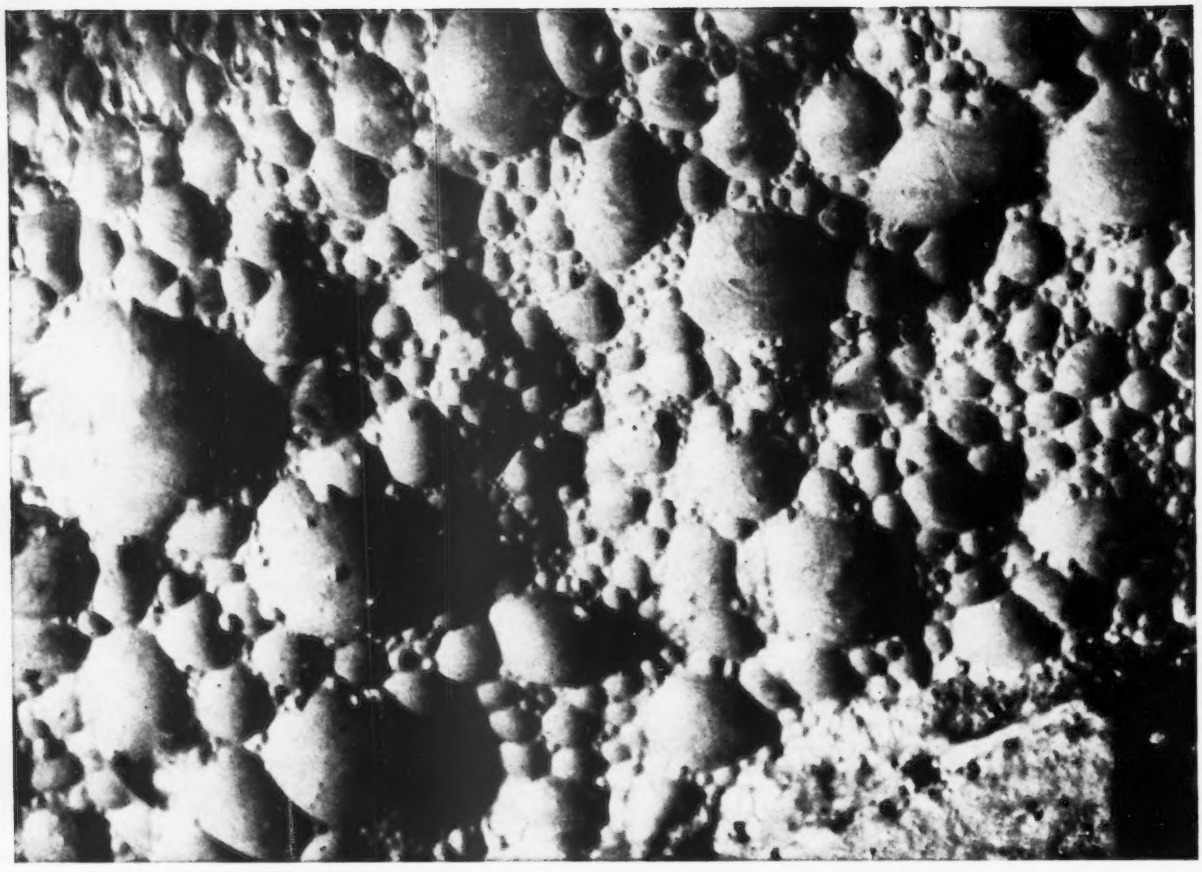
10 to 50 times more wear

What's more, Allis-Chalmers Rubber-Lined Pumps stand up 10 to 50 times longer than hard alloy pumps, minimize equipment costs. You'll save, too, because the A-C rubber linings are bonded to a steel skeleton which is bolted to the casing. There's no possibility of lining "pop out" or deformation.

Find out how these and other advantages of Allis-Chalmers pumps help you enjoy lower cost per gallon. See how every A-C pump is engineered to its specific application. Ask your representative or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 52B8156. A-4389

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



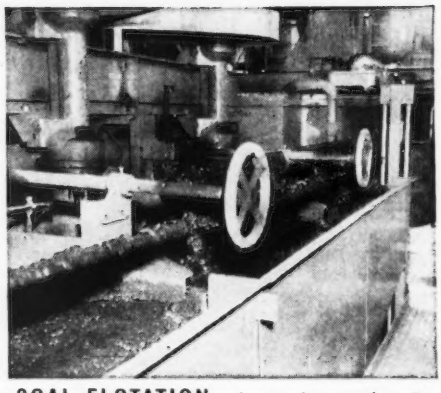
FOR MAXIMUM RECOVERY AT MINIMUM COST

List the characteristics of a good flotation agent and you'll see why Hercules Yarmor® F Pine Oil has remained a standard of quality for more than thirty years. Economy, strong froth with good volume, satisfactory texture, excellent cell-life stability—Yarmor F Pine Oil has them all.

Widely used as a frother for sulfide minerals such as zinc, copper, nickel, iron and lead sulfides, Yarmor F Pine Oil has also shown excellent results in the recovery of gold ores and native metals. This low-cost frother is also ideal for use in the benefication of nonsulfide ores such as coal, mica, quartz, graphite, feldspar, phosphate rock, and talc.

Other Hercules' flotation agents include Hercules Rosin Amine D Acetate, a siliceous mineral collector that is particularly suited for the phosphates. For information on these and other Hercules flotation agents, write:

Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
933 King Street, Wilmington 99, Delaware



COAL FLOTATION—A growing market for Yarmor is in the recovery of fine anthracite and bituminous from silt.

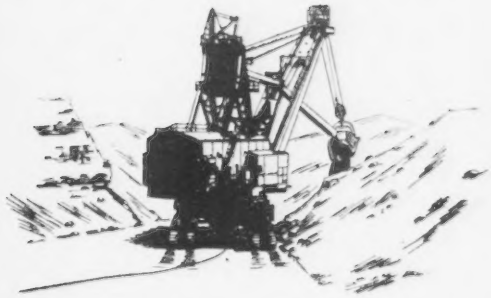
HERCULES FLOTATION AGENTS

BM54-1

Roebling Roeclad Type SH-D Trailing Cable is approved by the Pennsylvania Bureau of Mines Approval P-111, and complies with the requirements of the U. S. Bureau of Mines for flame-resistance. It is continuously mold marked for positive identification.

For safety... maximum service life...

ROECLAD TYPE SH-D TRAILING CABLE



BUILT FOR heavy duty service on such equipment as shovels, draglines and dredges. This cable is designed to provide maximum protection for workmen and longest life on the job under the most arduous conditions.

CONSTRUCTION

Conductors are tinned copper wire, rope stranded for extra flexibility.

Insulation over conductors is ozone and heat resistant, high voltage rubber compound.

Cabling — Multiple conductor cables are cabled together with rubber fillers (for greater flexibility, jute fillers may be specified).

Reinforcing braid is seine twine, for greater impact and tear resistance.

Jacket is made of thick Roebling Roeprene (neoprene), lead mold cured to give the cable firmness and compactness. The jacket is highly resistant to impact, abrasion, moisture, sun-cutting and deterioration from oil and chemicals.

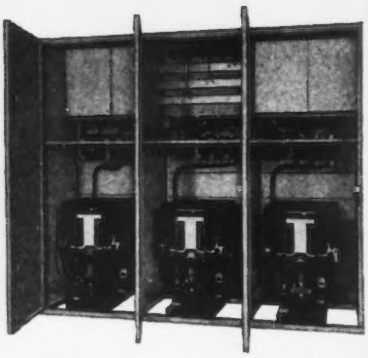
If you want more information call your nearest Roebling office (listed below) or your Roebling distributor, or write to John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING CF&I

Subsidiary of The Colorado Fuel and Iron Corporation

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HGTS. BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, ROOM 239, HENRY W. OLIVER BLDG. • ROCHESTER, 1 FLINT ST. • ST. LOUIS, 3001 DELMAR BLVD. • SALT LAKE CITY, 526 W. 8TH SOUTH ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

"Starting Line-up"



Rear view of HALC Controller Line-up. Bus covers provide maximum protection for personnel and equipment. Starters may be equipped with either oil-immersed or air-break contactors . . . installed in the same space. All components are readily accessible for maintenance.

ALLIS-CHALMERS

Type H Starters

FOR 2300 TO 3000 VOLT MOTORS

▶Easy to Install ▶Simple to Expand ▶Attractive in Appearance

The factory assembled line-up of Type H Starters affords the many advantages of centralized high voltage control for an entire department or plant. One attractive, space-saving group takes the place of many separate cabinets and components. Planning and purchasing are simplified. Installation is quick and easy — only one incoming power feeder required. Internal bus and convenient wiring provisions plus standardization of cubicle size facilitate the addition of starters.

Allis-Chalmers Type H Starters may also be used singly. Each starter is a complete control unit. Contactors, protective devices, meters, relays . . . all the coordinated components necessary for maximum protection of man, motor and machine are engineered into each starter. A-4217

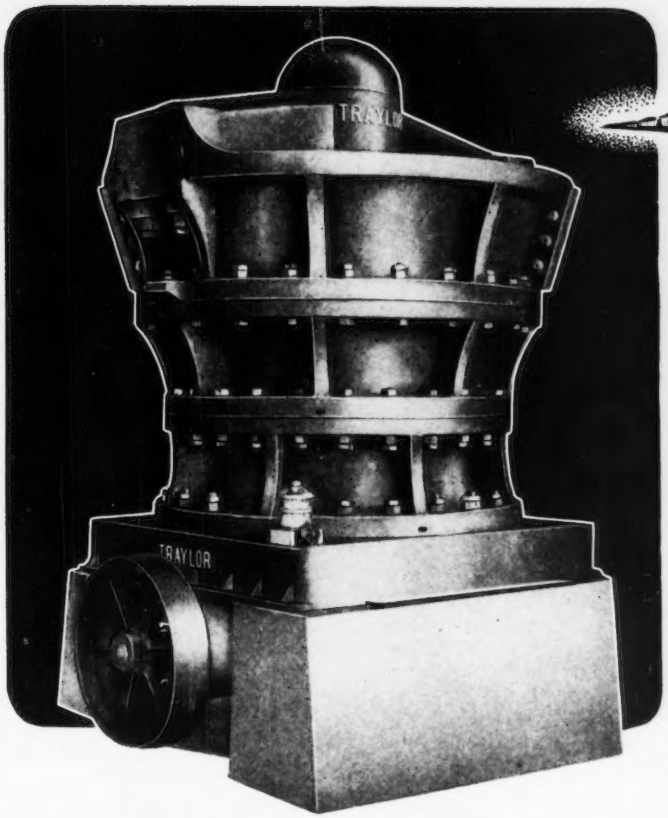
New Bulletin — Type H Starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors . . . for full or reduced voltage . . . reversing or non-reversing . . . with plugging, dynamic braking and multi-speed features. New bulletin 14B6410B tells the complete story. See your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

119,000,000 tons

AND STILL GOING STRONG



A TRAIN

16,227 MILES LONG

would be needed to carry the output of a typical

TRAYLOR 60" GYRATORY

ONE 60" Traylor Bulldog Crusher, installed in 1942, has worked continuously for 10 consecutive years. As a result it crushed well over 119 million tons of ore . . . and is still producing 6" ore at the rate of 3,984 tons per hour. Today, Traylor TC Gyratory Crushers, equipped with their original non-chokable bell head and curved concaves, continue to set amazing production records throughout the world. Traylor curved crushing surfaces apply power as a *direct* crushing force to reduce lifting and churning of material in the crusher. Each succeeding zone in the crushing chamber is of greater capacity . . . thus, choking and packing are practically eliminated. These features cause less wear on crushing surfaces . . . enable the Traylor TC to stand up to long years of steady and continuous operation with only routine maintenance.

Mail this coupon today for your copy of Traylor's Bulletin 126 which gives full details.

Traylor

TY REDUCTION CRUSHERS

TRAYLOR ENGINEERING & MANUFACTURING CO.
692 MILL ST., ALLENTOWN, PA.

Send me Bulletin 126 with illustrations and specifications of Traylor TC Gyratory Crushers.

Name: _____

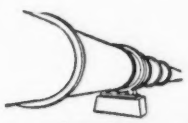
Position: _____

Company: _____

Address: _____ *State:* _____

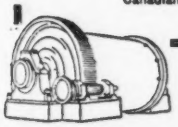
Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

Primary Gyratory Crushers



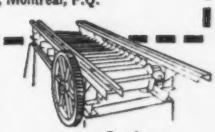
Rotary Kilns

Secondary Gyratory Crushers



Ball Mills

Jaw Crushers



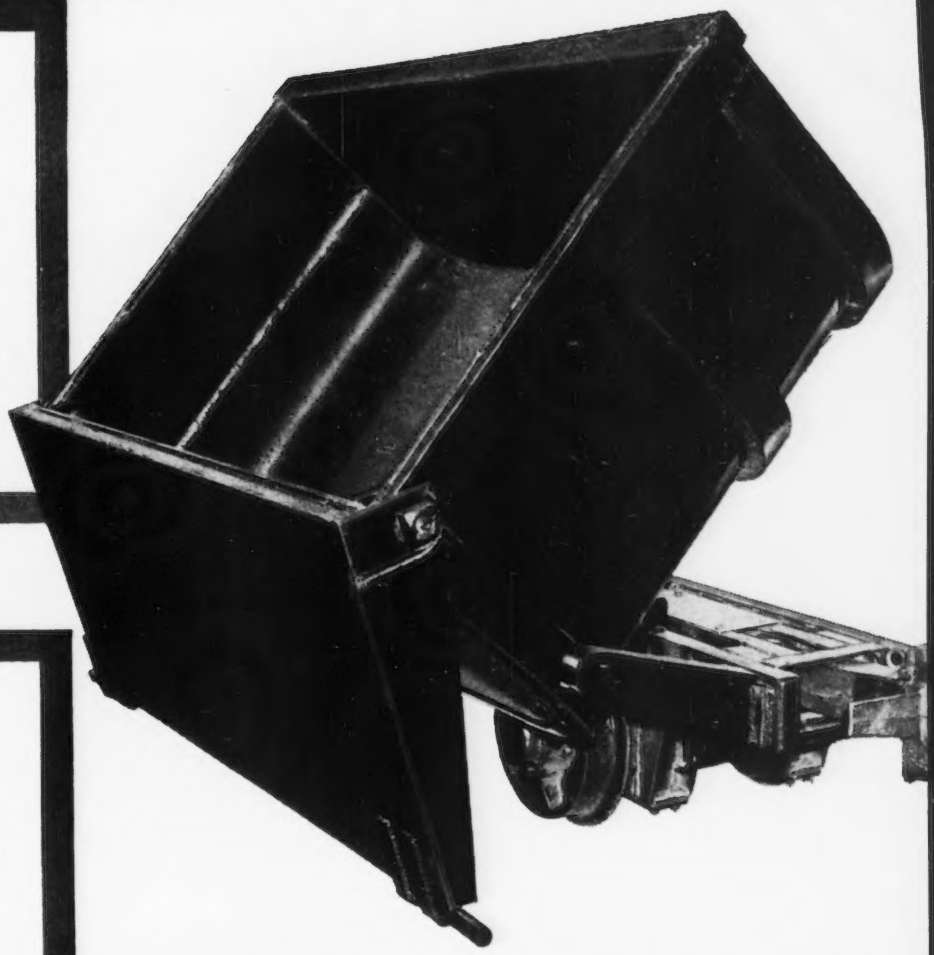
Apron Feeders

Mining equipment can do more work when it's built with

USS High Strength Steel

This Big Bucket can scoop up 30 cu. yds. of overburden at one bite. This means it has to take a lot of pounding and abrasion. And it can—because it was built with USS TRI-TEN steel which insures high resistance to impact and shock even at low temperatures, along with high strength and good welding properties.

Here's a Heavy Duty 50 Cu. Ft. Car built with USS COR-TEN steel. The car was especially designed to stand up under the most severe conditions. It has a 5/16" thick body and a 1/2" thick inside liner—both made of COR-TEN steel plate. This extra rugged construction, which greatly increases strength and durability, pays off in fewer breakdowns and longer life.



Built with USS MAN-TEN steel this 28 cu. yd. capacity hydraulic dump truck body—one of the world's biggest—can carry 45 tons of material, can dump a full load in 20 seconds and has a road speed of 32 miles per hour. Here's real ability to deliver the goods.

WITH USS High Strength Steels you can give your mining equipment the rugged durability it needs to stand the punishment of today's high speed mining operations.

These famous "steels that do more" will keep your equipment *in* operation, moving tonnage, and *out* of the maintenance shop where repairs and replacements cut into profits. For USS COR-TEN, USS MAN-TEN and USS TRI-TEN steels have a 50% higher yield point than ordinary carbon steel. In addition to greater strength they provide higher resistance to fatigue, wear, abrasion and impact.

These superior physical properties of USS High Strength Steels can be used to materially increase the strength and life of equipment without increasing its weight. Conversely, in some applications it is possible to use these tough steels in thinner sections to reduce weight without reducing strength, or to increase the size and capacity of equipment, without increasing its weight or the power needed to operate it.

Moreover, if your mining equipment must work in sub-zero temperatures, or under unusually corrosive conditions, you can build it with a USS High Strength Steel that will resist these destructive forces to keep it on the job and prolong its life.

For more information or application data about USS High Strength Steels phone or write our nearest office.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

USS COR-TEN • USS TRI-TEN USS **USS MAN-TEN • USS A-R STEEL**

4-488

UNITED STATES STEEL

Crushing Life Increased 14 Times *by* **Hard-Facing**

The hard-faced rolls on this rock-crusher mill have been in constant operation for six years. During this time, the rolls have been pulverizing such abrasive materials as ferro-alloys, ore, dolomite, feldspar, rock, sand, and clay used for making brick. Unprotected rolls, performing the same operations, had to be replaced every four or five months.

The serrated roll shown at the right in the photograph is the roughing roll used for initial grinding or milling. The smoother roll, at the left, is a finishing roll used to grind the abrasive materials into a powder. Both rolls were hard-faced with HAYNES STELLITE alloy by the metallic-arc process to protect them from abrasion.

There are 14 HAYNES alloys . . . each developed to resist certain conditions of wear. Some of these alloys are hard and abrasion-resistant, some are tough enough to stand up under heavy impact . . . others resist corrosion, erosion, or heat. Use them to protect bull-dozer blades, dipper bucket teeth, sheepsfoot tampers, tractor rollers and other metal parts exposed to wear.

Your dealer carries a complete line of HAYNES hard-facing rods. Ask him for our descriptive literature. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana, for full details.

See... Your local Haynes Stellite Dealer

or

Write... to Haynes Stellite Company

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

Cyanamid REAGENT NEWS

The Work-horse Reagents . . .

LIQUID AEROFLOAT® PROMOTERS

Like a virtuous wife, the unusual merits of Liquid AEROFLOAT Promoters tend to be taken for granted. For years they have been recovering a high percentage of the world's copper, lead and zinc. Alone and with other promoters, they are perhaps the most popular group of flotation reagents ever developed.

But, we find, because of excellent results achieved with one (Liquid AEROFLOAT 15 and 25, for instance), metallurgists sometimes forget to check *all* the AEROFLOAT Promoters for specific ores. So, as a gentle reminder . . .

Cyanamid currently offers six Liquid AEROFLOAT Promoters (15-25-31-33-241 and 242) with gradations in both promoting and frothing characteristics. All are rated "strong" to "very strong" promoters. But frothing varies from "strong" in AEROFLOAT 15 to "some" in AEROFLOAT 242. All are selective rather than universal promoters. They have the added advantage of reducing frother costs.

May we suggest testing *all* the Liquid AEROFLOAT Promoters in various combinations and with other reagents? Cyanamid Field Engineers are familiar with the various combinations that have proved most effective in mills throughout the world. They will be pleased to work with you.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

Cable Address — Limenitro, New York

NORTH AMERICAN CYANAMID LIMITED
Royal Bank Bldg., Toronto 1, Ontario, Canada

CYANAMID DE MEXICO, S. A.,
Apartado No. 26012, Mexico 12, D. F., Mexico

CYANAMID PRODUCTS, LTD., Bush House,
Aldwych, London W. C. 2, England

SOUTH AFRICAN CYANAMID (PTY.) LTD.,
P. O. Box 7552, Johannesburg, Union of South Africa

E. P. CADWELL, Casilla 12983,
Correo 11, Santiago, Chile

G. B. O'MALLEY, MALCOLM GLEN,
377 Little Collins St., Melbourne C. 1, Australia

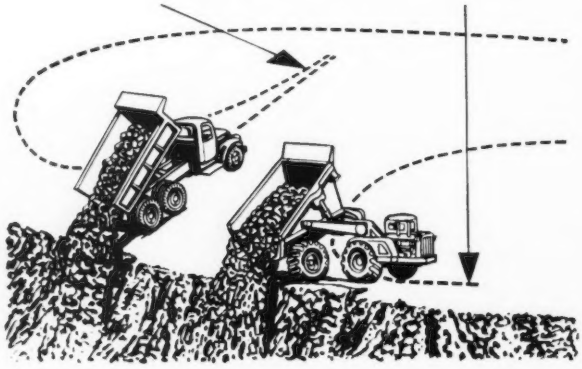
30 FEET OF TRAVEL... ...SECONDS OF TURNING SAVED...

You can eliminate 30 feet of travel and 30 seconds of maneuvering with an Athey PR21 Rear-Dump Trailer. Rear-dump trucks have approximately 45° turning ability . . . it takes twice as much space *and* time to swing onto the fill, back and dump! With the PR21 you make turns of 90° under hydraulic-control. The rig can turn in less than its own length, without stopping! It can maneuver, turn and dump its 22.5 cu. yd. load on a 36-foot wide fill. The trailer can be dumped with the tractor at any angle. The 30 feet and 30 seconds that a PR21 saves can mean added production and profit!

Change your fill traffic pattern to a short, safe, profitable Athey PR21 pattern—your Athey-Caterpillar Dealer can show you how!

ATHEY PRODUCTS CORPORATION
5631 West 65th Street Chicago 38, Illinois

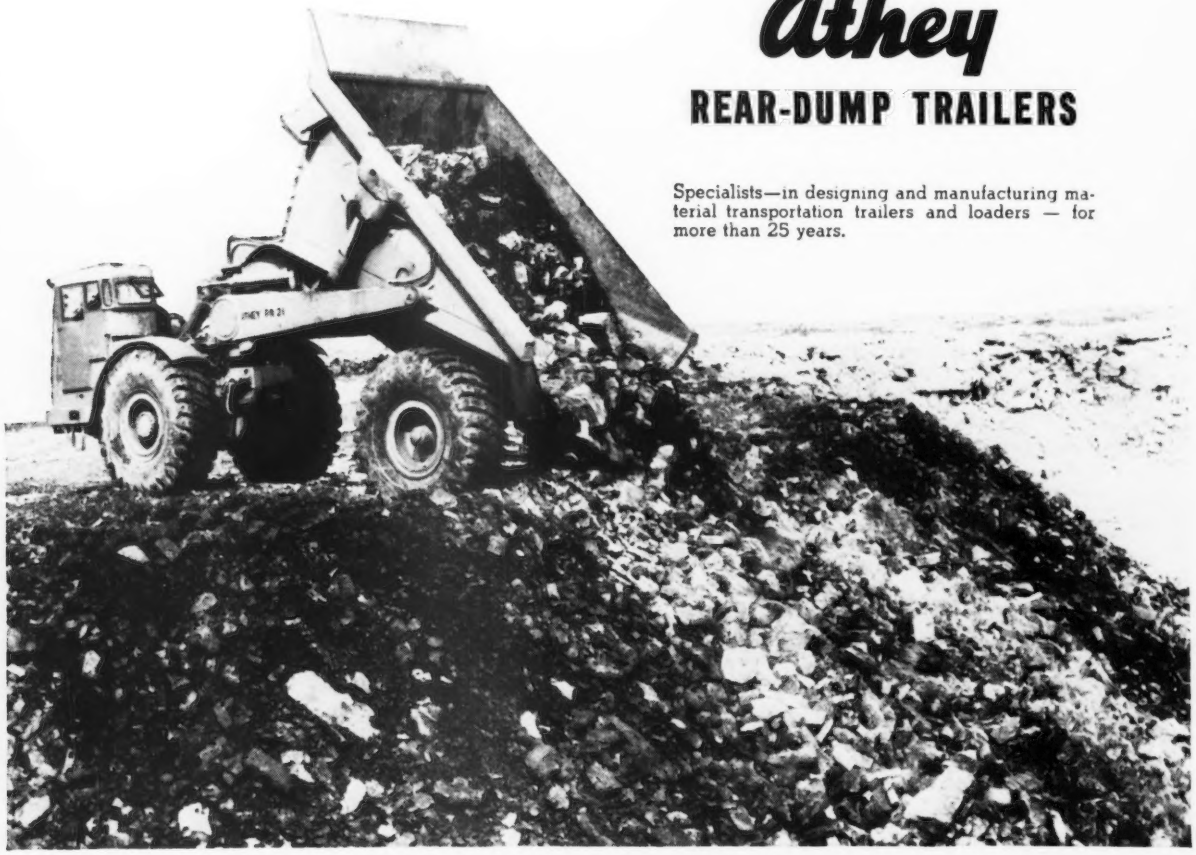
NOT THIS . . . BUT THIS



By turning 90° to back to the edge of the fill, the Athey PR21 saves 30 feet of travel, 30 seconds of time. Write to Athey for the new catalog that shows how the PR21 saves you money—loading, hauling, dumping. *It's free!*

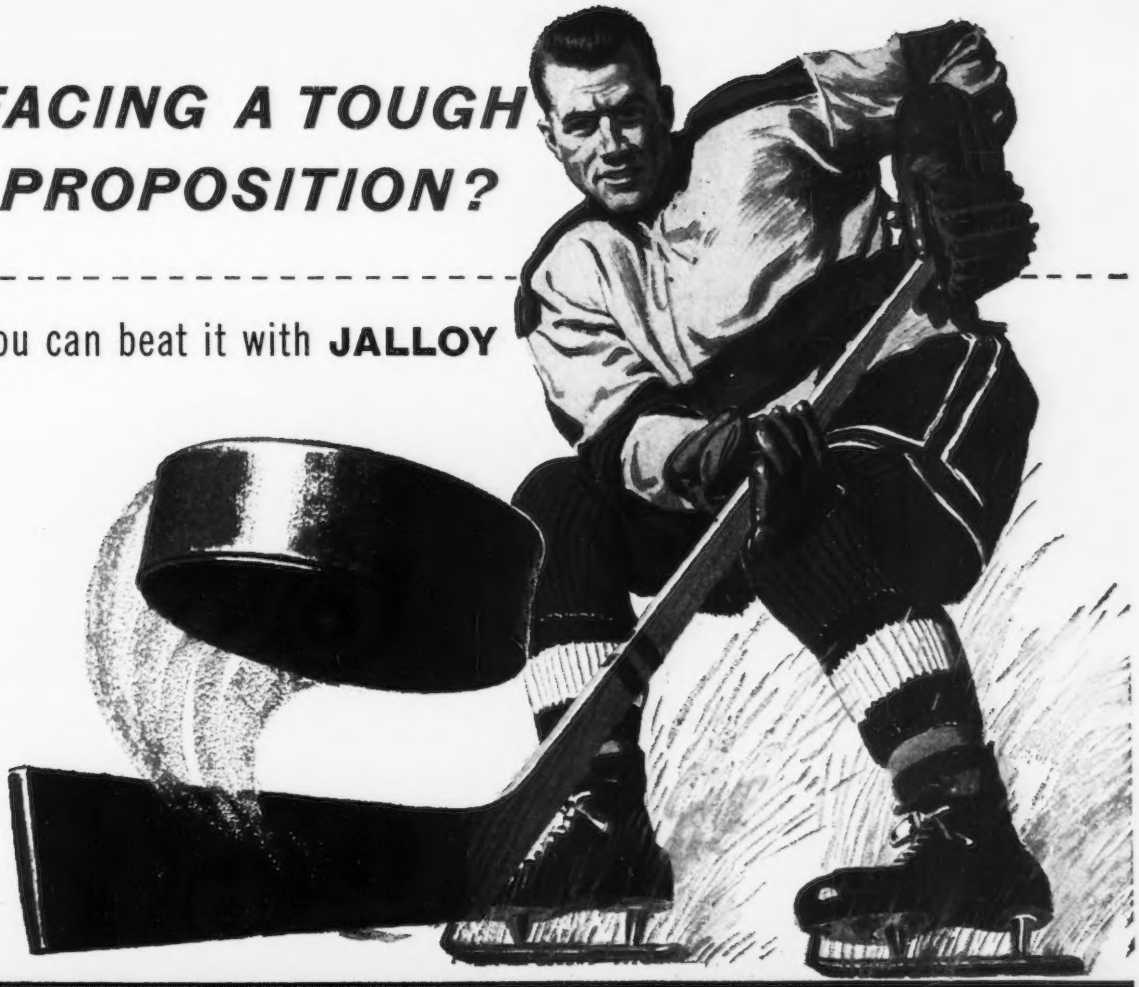
Athey
REAR-DUMP TRAILERS

Specialists—in designing and manufacturing material transportation trailers and loaders — for more than 25 years.



FACING A TOUGH PROPOSITION?

you can beat it with **JALLOY**



J&L JALLOY HEAT-TREATED PLATE BEATS WEAR DUE TO ABRASION

J&L Jalloy Heat-Treated Plate is the general purpose steel that is heat treated to provide longer wear on applications where impact and abrasive conditions are severe.

In comparison with other abrasion-resistant steels as well as mild steels, it gives optimum results when heat treated to a Brinell hardness of 340 and up. Jalloy permits savings in steel costs, maintenance, and repair. Furthermore, it is easily welded. Jalloy is available in three grades to meet various service requirements.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 412, Pittsburgh 30, Pa.

☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

Name_____ Title_____

Company_____

Address_____

_____

BIG YARDAGE SPECIALIST

The large capacity, long working range and easy maneuvering of the 480-W walking dragline help make it ideal for the profitable handling of big-yardage stripping. Built into this new model are the same advanced features that have earned for Bucyrus-Erie walkers a world-wide reputation for outstanding performance.

There's the exclusive Bucyrus-Erie walking mechanism for easy, accurate move-ups, and the balance of weight and loads that keeps the center of gravity well within best working limits. The large bearing area of the big circular base permits working close to banks and on soft ground in any weather. Main machinery is simple, with a minimum of moving parts, and is held firmly in alignment. Let us show you how the 480-W can give you big-yardage stripping at moderate cost.

Available with Ward Leonard Electric or Diesel Power and three combinations of bucket size and boom length 19L54

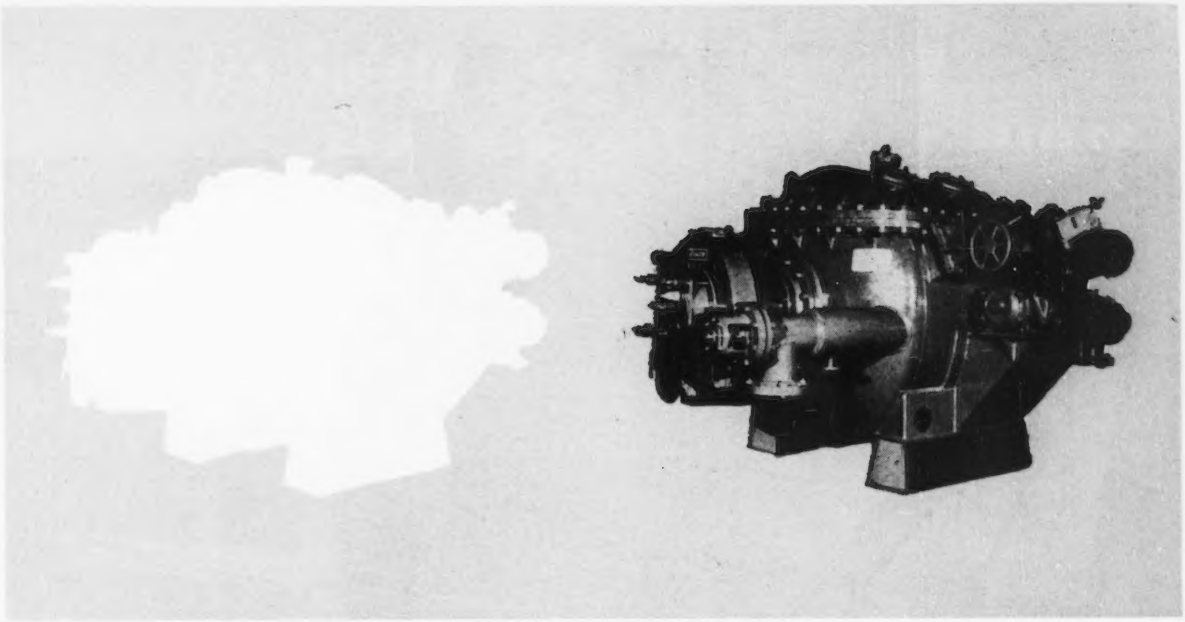
Boom Length	Bucket Capacity	Distance Material Can Be Moved*
215 ft.	8 yd.	431 ft.
195 ft.	10 yd.	395 ft.
175 ft.	12 yd.	359 ft.

*without throwing bucket. Digging depths range up to 141 ft.

Walking Draglines . . . SOUTH MILWAUKEE

BUCYRUS ERIE

. . . 4- to 30-cu. yd. capacity WISCONSIN



Price or Performance?

When you have a place for a filter in your flow sheet and the function of this particular step is important, your purchasing should be done on the basis of performance and not price.

If you buy on the basis of performance, with specifications and design guaranteed to meet the performance, your first choice will be an Eimco.

If your work, however, can be satisfied with so many square feet of filter area and your first consideration is price, there are many able to supply your needs.

Eimcos are not cheap because they have built into them the heavy construction, the precision design and the unique know-how that comes with more than half a century of sucecssful experience.

Eimco will devote to your filtration problem, be it vacuum or pressure, the skill of its trained engineers in research, testing, design and construction. It will then guarantee successful results duplicating the test work necessary to prove your flow sheet.

Does your process need the best? If it does and you are willing to look beyond first cost, it will pay you to have Eimcos at the start.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

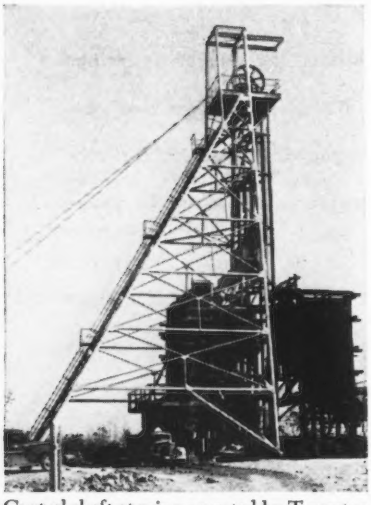
B-75

You Can't Beat An Eimco!

Clyde Patton, sales engineer, of Brunner & Lay Rock Bit, chats with Benton Bailey, assistant to general manager, and Elmer Roberts, foreman, Tungsten Mining.

Bethlehem Hollow Drill Steel bites into a quartz vein on the 700-ft level. The 1-in. hexagon alloy drill steel is fitted with carbide bits. Both were furnished by Brunner & Lay Rock Bit Corporation, Asheville, N. C.

North Carolina Mine Yields Huebnerite Tungsten Ore



Central shaft at mine operated by Tungsten Mining Corporation, Henderson, N. C., extends to depth of 1600 ft. Steel headframe is 72 ft high.

A good grade of tungsten ore, huebnerite-quartz, is being mined in, of all places, North Carolina. The underground mine, hundreds of miles from other commercial tungsten deposits, is located in rolling country north of Henderson. It is operated by Tungsten Mining Corporation, of Henderson, and is producing in the neighborhood of 800 tons per day.

The operators are using a modified system of square-set stoping, and are hoisting the strategic ore from two shafts, each 1600 ft deep. The huebnerite is found in quartz veins, with sericitic-schist walls. The country rock is a hard granite-gneiss. Drilling conditions vary, and include very hard, medium-hard, and abrasive formations.

Drilling is being done by means of jackhammers, stopers and drifters. Blast holes are 6 ft to 11 ft deep. An alloy type of Bethlehem Hollow Drill Steel, 1 in. hexagon and fitted with carbide-insert bits, is being used exclusively. The operators report that it is giving excellent service.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Two Grades of BETHLEHEM HOLLOW DRILL STEEL

CARBON • ULTRA-ALLOY (chrome-moly)

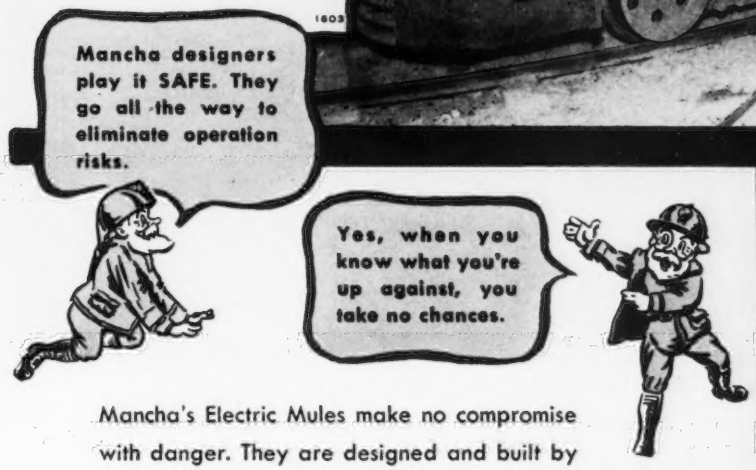
It's Safety First All The Way with MANCHA'S ELECTRIC MULES

the TITAN

featuring Trackmaster* design, is rugged, tough, and safe. Built in two sizes: AN, 4 tons; BN, 2½ tons.

*REG. U. S. PAT. OFFICE

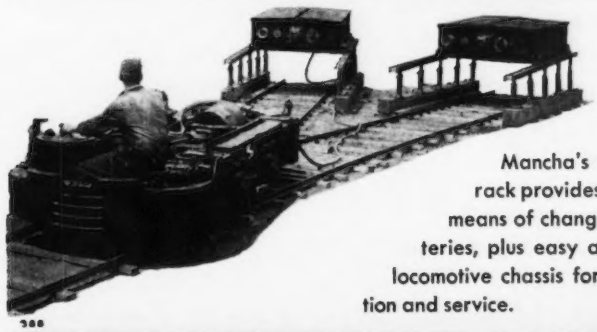
1603


Mancha designers play it SAFE. They go all the way to eliminate operation risks.
Yes, when you know what you're up against, you take no chances.

Mancha's Electric Mules make no compromise with danger. They are designed and built by men who know mining, who anticipate mining hazards, and who act to offset trouble before it develops. That's why Mancha locomotives are safe all the way—particularly for the men who operate them.

These distinctive characteristics make Mancha's Electric Mules completely safe and reliable:

- Spring suspension, wheel equalizers, ample track clearance and low height promote safe operation on unusually bad track, where curves are sharp and clearance limited.
- The motorman is assured protection. Cast steel end cabs, rolled steel side plates, rounded bumpers, and extra large cab space combine to make his job comfortable as well as safe.
- Oversize motor; unbreakable alloy grids; antifriction bearings; substantial battery box which excludes dirt and water; accessibility throughout.



388

Mancha's transfer rack provides a quick means of changing batteries, plus easy access to locomotive chassis for inspection and service.

Mail the coupon for illustrated bulletin showing performance charts and complete specifications.

Mancha Storage Battery Locomotive, U.S.A.
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Illinois
E & M J 1054

NAME _____

FIRM _____

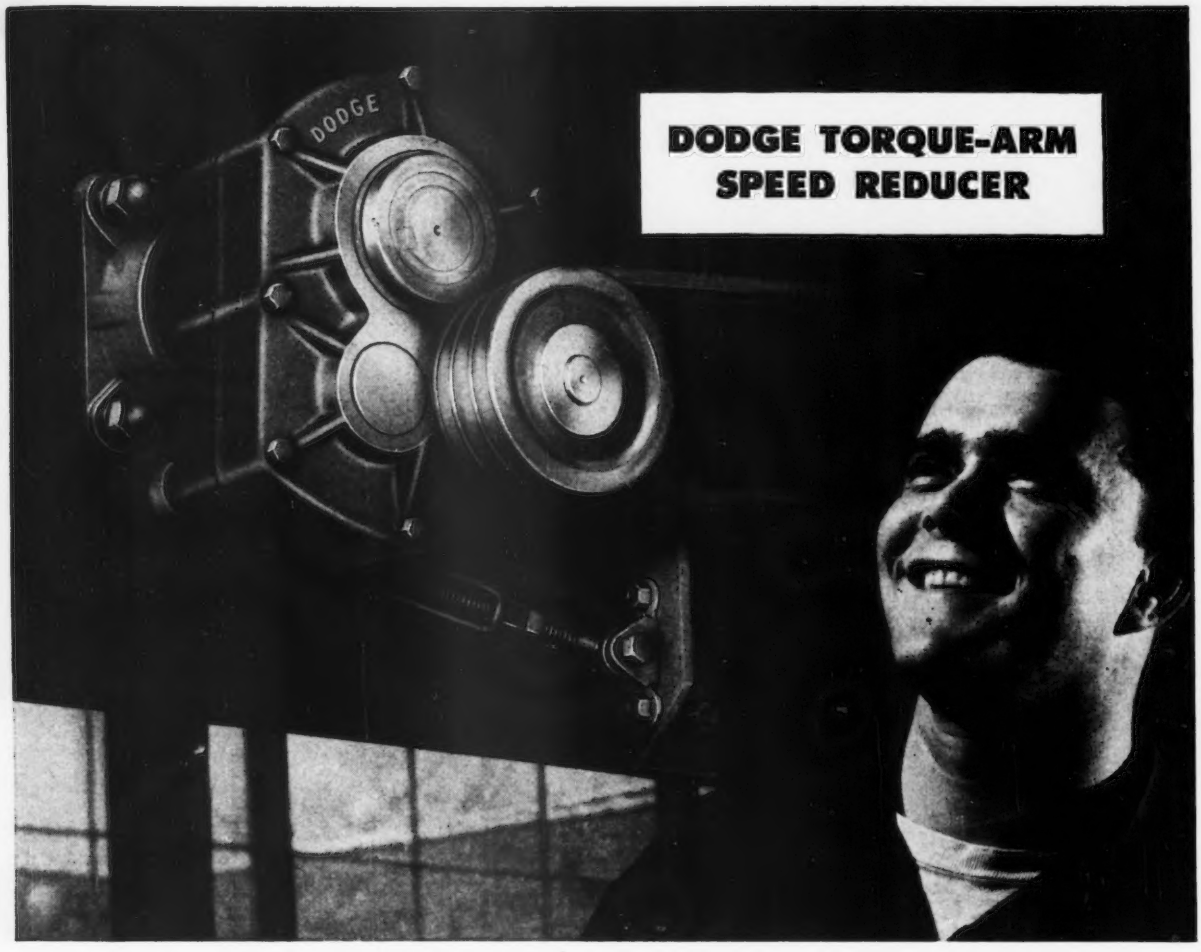
ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE

Division **GOODMAN** *Manufacturing Company*

4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.



Costs less - Delivers more!

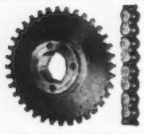
Savings up to 33% . . . efficiency up to 97% . . . are yours with this new and better kind of speed reducer. Proved in tens of thousands of installations, in all types of industry!

This reducer is mounted directly on the driven shaft. No foundation, no flexible couplings, no sliding base required. No lining up difficulties. The torque-arm, fastened to any fixed object, anchors the reducer. Unit is driven through any V-belt drive. Stock Taper-Lock Sheaves prescribed for each job. Tri-Matic Overload Release and Backstop are available if desired.

Torque-Arm Speed Reducers are sold from Distributor's stocks—in single reduction and double reduction series—with capacities from 1 to 43 hp and output speeds from 12 to 330 rpm. Standardize on this modern idea in speed reduction—it saves you money.

DODGE MANUFACTURING CORPORATION, 3100 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.


TAPER-LOCK SPROCKETS AND DODGE ROLLER CHAIN

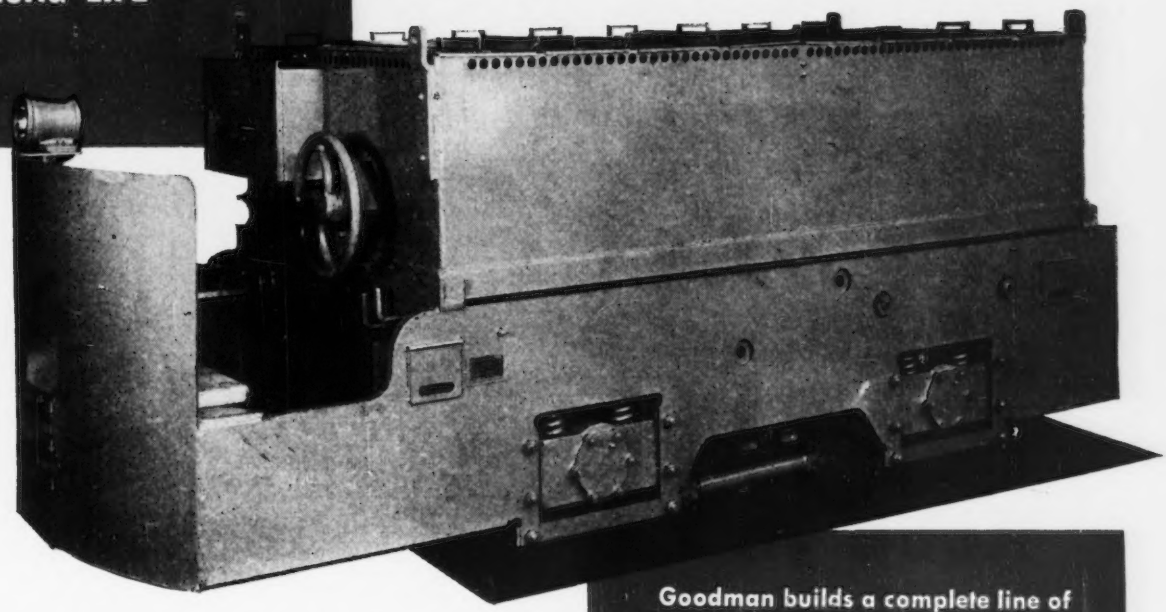
TAPER-LOCK SHEAVES

DODGE-TIMKEN PILLOW BLOCKS

Call the Transmissioneer, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

- SAFE OPERATION
- CONTINUOUS SERVICE
- LOW MAINTENANCE
- LONG LIFE

YOU GET THEM ALL
IN
Goodman
METAL MINE LOCOMOTIVES



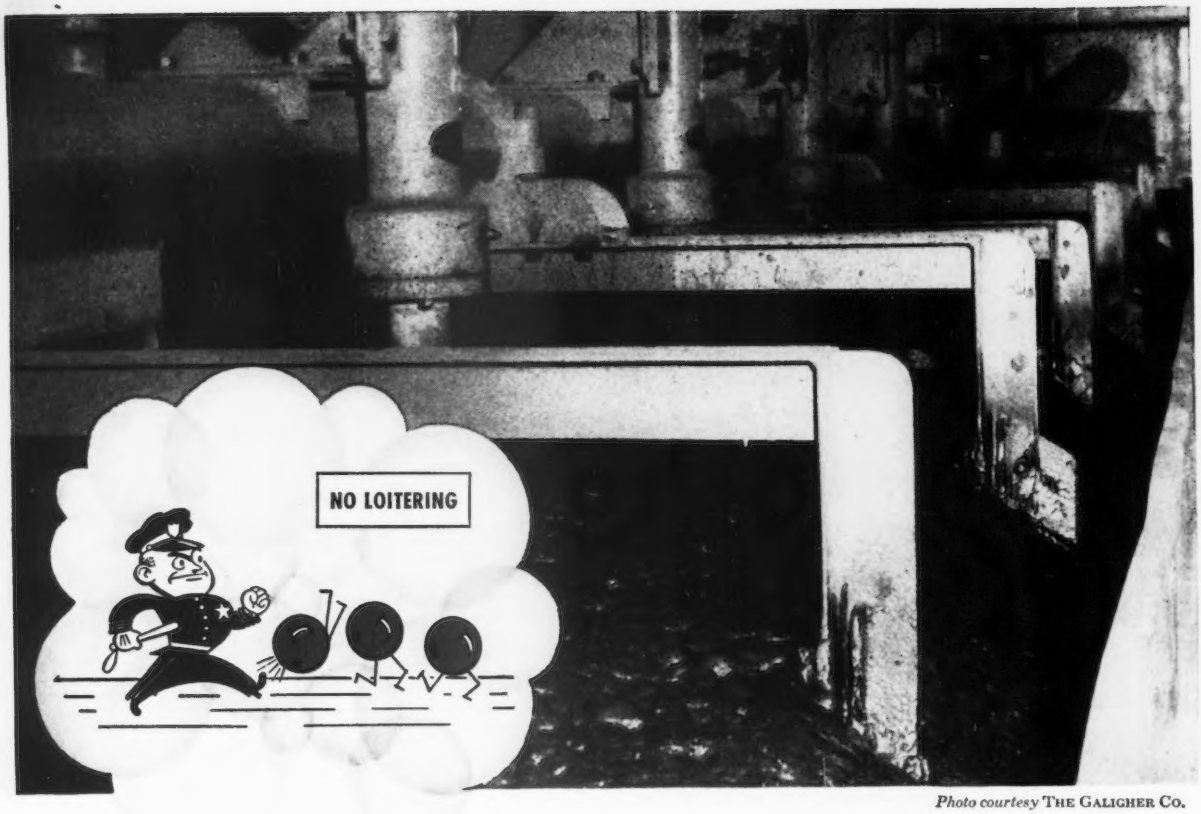
Each Goodman locomotive is recommended for a particular job only after a thorough study of mine requirements, now and in the future.

So dependable is Goodman locomotive performance, so rare the interruptions of haulage, that production every shift is at its maximum. Rugged construction keeps maintenance and depreciation charges to a minimum.

Goodman builds a complete line of trolley and storage battery locomotives. Illustrated here is a 4-ton (chassis weight) storage battery unit for 36" gauge. Over-all dimensions: length 12' 8", width 56"; height (over battery box) 59". Wheelbase is 54". A feature is slow speed armatures with single reduction gearing. Each of its two motors is 19 hp at 80 volts; rated drawbar pull is 2,000 lbs. at 4½ mph.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES



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Keep your bubbles moving

Keeping flotation cell bubbles moving is the way to low-cost milling operation. Overflowing solution blocks that way by damaging power cables. Damaged cables stop power, motors, bubbles, and profits.

Simplex-ANHYDREX Cables help reduce overflow damage with their specially compounded neoprene jackets. These jackets are highly resistant to alkalies, sludges, and oils that spill over the launder. That means these cables last longer and, therefore, cost you less per ton of ore handled.

Another advantage of these cables is the Anhydrex insulation. It has a guaranteed maximum water absorption of 20 milligrams per square inch. Even when completely submerged, it will retain its physical and electrical properties indefinitely.

With about one quarter of your total milling cost going for electric power, it makes sense to use the most dependable cables you can buy. Simplex-ANHYDREX Cables have that long life and dependability you are looking for. If you want to know more about how ANHYDREX helps to keep bubbles moving, write to the address below.

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MORE GRINDING PER PLATE... REDUCED COST PER TON...

with USS Lorain Rolled Plate Linings

MADE from top-grade *rolled steel*, Lorain Linings have far greater wearing life than regular cast linings. Their outstanding strength makes possible the use of thinner sections, saves first cost of metal . . . increases usable diameter of the mill, boosts output. The tight joints between ends of plates and close fit between plates and lift bars eliminate shell wash and allied troubles.

No matter what you grind, USS Lorain Rolled Plate Linings will produce better grinding results, more economically. They're made in easy-to-handle sections that save hours of installation time. They keep mill down-time to a minimum. They're so rugged they'll wear 'til they're paper thin without failing!

The Liner Plates of Lorain Linings are made symmetrical and interchangeable. Severe localized wear at feed or discharge end can be balanced by heat-treating. The lift bars, carefully designed to insure correct cascade action, are available in different lift heights to suit conditions. Lift height will remain approximately constant for life of the lining.

USS Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.

USS GRINDING BALLS are carefully made of special composition steel to take long, rough wear evenly. Samples from each production lot are thoroughly tested to make sure of surface hardness and maximum hardness penetration. They come in eleven sizes from ¾" to 5". For further information just return the coupon at the right.

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Without obligation on my part, please send me your FREE booklet on USS Grinding Balls.

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USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

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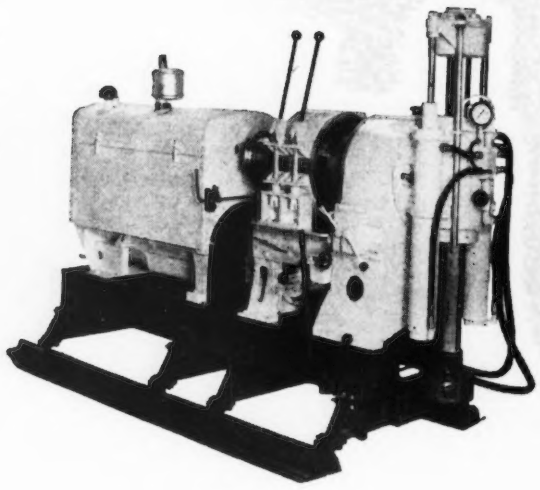
UNITED STATES STEEL

THE GREAT NEW Longyear 44



Here's a new diamond core drill,
built to give outstanding drilling performance at remarkably low cost.
The Longyear "44" is a *drill-runner's drill!* Its design is a result of recommendations from diamond drilling men all over the world.

CHECK THESE FEATURES FOR SIMPLE OPERATION AND HIGH EFFICIENCY:

Capacity — 3000-4000 feet of "A" rods.

Heavy Duty Hoist — a 13" drum provides extra capacity, uses planetary gears, will spool rope properly.

Oversize Brake Bands — metallic linings assure safe and rapid handling of drill rods at depth.

Choice of Motive Power — wide selection of gasoline, Diesel, electric or air.

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New Swivel Head — handles all sizes of rods, including 2-⅞" flush-coupled; Longyear Wire Line; and the newly adopted world standards.

Three-Jaw Safety Chuck — permits use of 3-fluted Kelly for deeper holes.

Mounting — available on a skid frame, or on a truck or trailer mounting.

Controls are centrally located for instant command of operation. Lubrication fittings are easily accessible for servicing. Gears are of finer pitch, to reduce drilling noise. Rugged construction assures long life and excellent service. In short, nothing has been overlooked to provide simple and efficient operation at the lowest possible cost to you.

The Longyear "44" is ready for your job. Send for Bulletin 90 to get full details and specifications.

An efficient contract drilling service is available to you at low cost.

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DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
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Saves year in completing road to isolated copper mines

Deep in Northern Rhodesia's forest wilderness, near the Belgian Congo border, lies what geologists call the most important single copper-producing area in the world. From a 40 x 140 mile belt comes 250,000 to 300,000 tons of metal annually — 10% of the world's supply. Though mining has been done here since 1927, roads are still inadequate. To bring in necessary supplies, or to carry out the rich copper sulphide ores is expensive, difficult, and time-consuming.

Modern machines make the difference

Recently, the Government of Northern Rhodesia moved to change this situation. A 95-mile all-weather road was planned. Engineers estimated 30 months would complete the project.

The contractors, Cramond Earth Movers Rhodesia Ltd., told the government they could better that schedule. In order to do it, they brought a fleet of 7 fast-operating, rubber-tired LeTourneau-Westinghouse machines to the job site at Choma. When photos were taken, these units were building 10 miles of road per month — instead of the scheduled 3 to 4 miles. Earthmoving was 60% ahead of schedule. Even allowing for lower output during the four-month rainy season, contractors and government officials believe the complete 95-mile route will be finished within 18 months.

Handle variety of work, faster

Two Tournatractors, three 14-yd. and two 7-yd. Tournapull-Scrapers have been working 72 hours a week, moving the 500,000 cu. yds. necessary to the job. After making major cuts and fills, Tournapulls spread and compact a laterite surface, finishing it to within one inch of grade line. Says Edward Austin, one of the officials of the company, "Accurate control of D Tournapulls has, on this job, cut grader work to an absolute minimum."

Moving subsoil for formation work, D Tournapulls have averaged a 2400 ft. load-haul-spread-and-return cycle every 6.3 minutes. Each unit has delivered 9 loads of approximately 5½ pay yards each per hour.

Before start of grading, D Tournapulls cleared away a number of ant hills like these. Each hill measured as much as 400 cubic yards.

Performance earns repeat orders

Cramond Earth Movers bought their first LeTourneau-Westinghouse machine, a second-hand Tournatractor, in 1950. Since then, they have purchased 6 more Tournatractors and Tournapulls. As a fleet, the 7 units have worked a total of 43,000 hours. Tires shown, each more than 4000 hours old, are still in usable condition. Mr. Austin reports, "Our Tournapull fleet has been increased three times, indicating our satisfaction. Downtime has been very low and production high."

Drive job-to-job

Another big advantage of rubber-tired units is their ability to drive job-to-job under their own power. These machines have traveled all over Central Africa to level marshalling yards and industrial sites, and to build sports fields and earth dams. Their big, low-pressure tires roll over paved highways, across country, or over railroad tracks without damage to surface or tires.

Let us help you

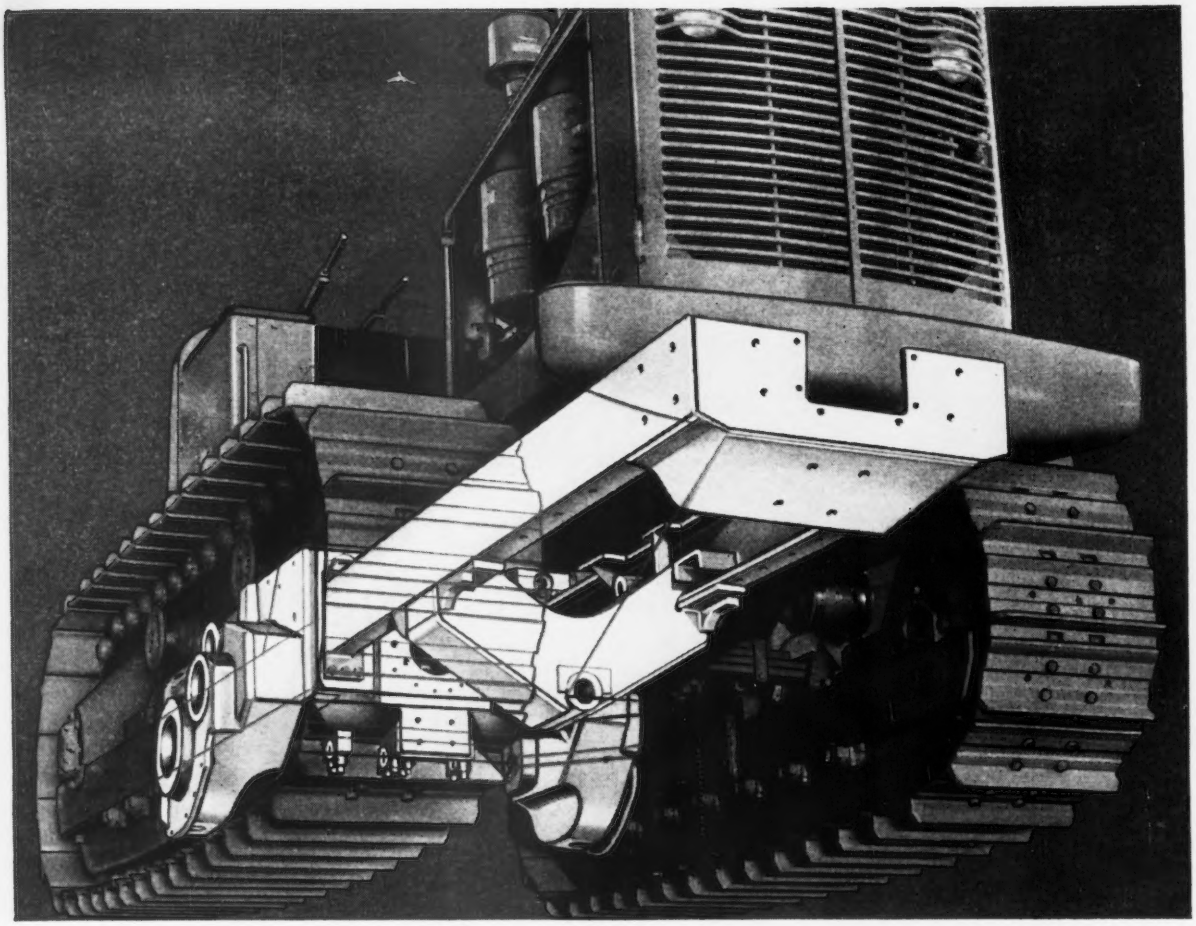
If you have similiar projects, it would pay you to find out how much LeTourneau-Westinghouse machines can save YOU in time and money. Call or write us for more information.

Tournapull—Trademark Reg. U.S. Pat. Off.
Tournatractor—Trademark TDP-683-H-b

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company



HOW THE MAIN FRAME CONTRIBUTES TO TOP TRACTOR PERFORMANCE

One of the big reasons why more and more Allis-Chalmers tractors are being used today is their exclusive main frame design.

These frames are one-piece, all-steel welded structural members (like the girders in a bridge or the columns in a building). They help provide greater strength and flexibility to withstand shock loads . . . make possible better equipment mounting, improved weight distribution and outstanding service simplicity as well.

We invite you to see these advantages . . . first at your nearby Allis-Chalmers dealer . . . and then in a demonstration.

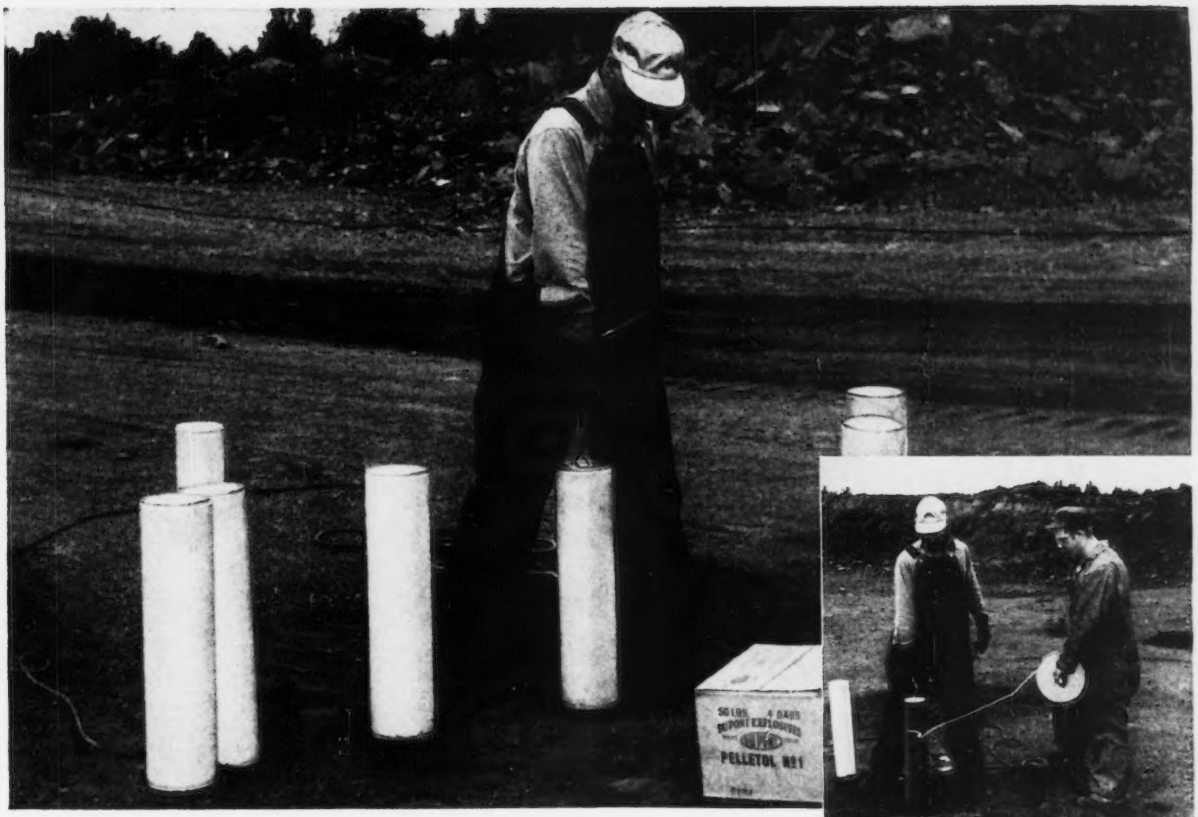
"ROLLS WITH THE PUNCH" — All-steel main frame flexes slightly under extreme shock loads . . . without transmitting strain to engine, clutch or transmission.

BETTER EQUIPMENT MOUNTING — This frame's compactness provides ample clearance for equipment like front-end shovels . . . permits wide track shoes . . . improves performance of entire unit.

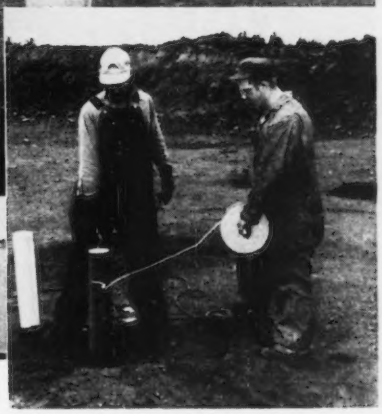
IMPROVED WEIGHT DISTRIBUTION — Box A-frame allows location of main components for best over-all balance . . . putting more weight lower in tractor where it does the most good.

SERVICE SIMPLICITY — Since main frame carries *structural* load, power drive components can be readily removed, repaired or replaced without disturbing adjacent parts.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE 1, U. S. A.



FIRST STEP to efficient taconite blasting—operator loading "Nitramex" No. 2 in northern Minnesota open pit iron mine. Thanks to the watertight metal containers, this can be done long before firing.



NEXT, "Nitramon" Primer is connected up with "Primacord," then lowered. This primer consistently sets off the charges . . . it's today's safest method!

Shooting taconite?

For better breakage, greater safety use DU PONT "NITRAMEX" No. 2

To take taconite shooting in stride and make each shot safer—use Du Pont Nitramex® No. 2 ammonium nitrate blasting agent. This hard-hitting product gives you the strength you need in tough formations to get excellent breakage. Just as important, built-in safety features minimize blasting hazards.

Fire, friction and sudden shock are no problem. "Nitramex" No. 2 can be detonated efficiently *only* by a "Nitramon" Primer, also relatively insensitive, and it does the job every time. Handling's safe and efficient, as neither contains nitroglycerin or is headache-producing. And you can load the charges weeks in advance of blasting. Sturdy metal cylinders protect them in wet holes, adverse weather. Another point customers appreciate: "Nitramex" No. 2 is absolutely non-freezing, assuring dependable shots whatever the temperature.

So test Du Pont "Nitramex" No. 2 in your own mining operation. You'll find it has the blasting power to handle tough rock . . . and provide an extra measure of safety on every job. For detailed information on this and all other members of the Du Pont ore-blasting "team," contact the Du Pont representative in your district. He'd like to be of service to you. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT

BLASTING AGENTS

Products of Du Pont Research

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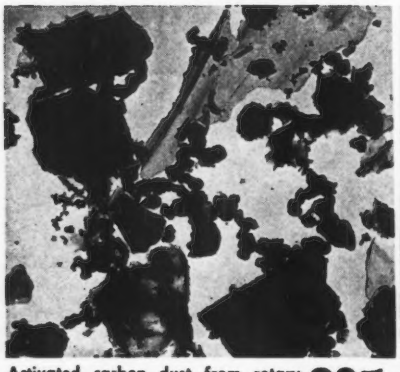
CHEMICO

P-A VENTURI GAS SCRUBBER

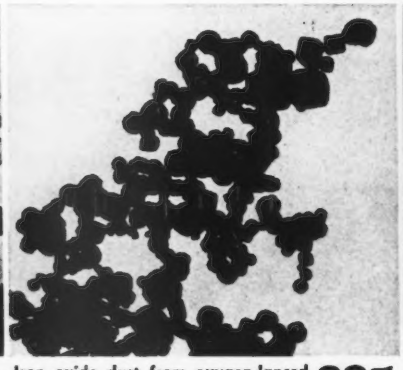
offers HIGH *efficiency*

AT LOW COST

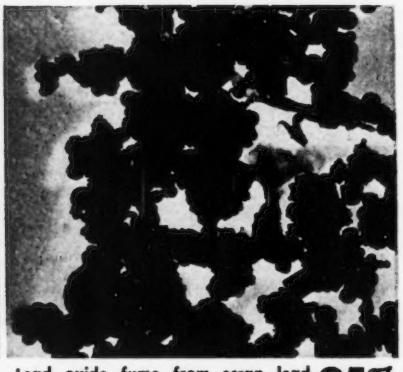
Typical efficiencies in the removal of sub-micron dusts



Activated carbon dust from rotary dryer. P-A Venturi Efficiency **98%**



Iron oxide dust from oxygen-lanced open hearth. P-A Venturi Efficiency . **99%**



Lead oxide fume from scrap lead blast furnace. P-A Venturi Efficiency . **95%**

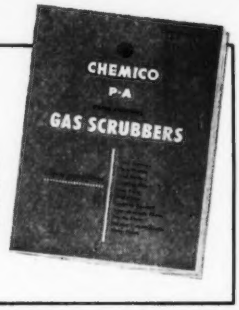
The Electron Micrographs above show the type of dust particles the Chemico P-A Venturi Scrubber removes almost completely from industrial gases. Equally important, the price of efficient P-A Venturi performance is *low* . . . in initial cost of the equipment, in maintenance and water requirements.

For gas scrubbing, for recovery of valuable metals and chemicals or for absorption of odors, it will pay you to investigate the Chemico P-A Venturi Scrubber.

NEW 8-PAGE BULLETIN

Fully illustrated Bulletin M-102 gives performance data and case histories on both the Chemico P-A Venturi and Cyclonic Gas Scrubbers.

Write for your copy today.



Phone (MU 8-7400) or write our P-A Sales Dept. for further information and ask for our Bulletin M-102 on P-A Gas Scrubbers.

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2 IMPROVED TYPES OF CAST-METAL MATRICES

2 MODERN POWDERED METAL MATRICES

DOUBLE-TUBE REAMING SHELL

Available in all standard sizes for use with all types of double-tube corebarrels. Special sizes and types as required. Inserts are tough tungsten-alloy matrix set with carefully selected diamonds.

SINGLE-TUBE REAMING SHELL

Available in all standard sizes for use with all types of single-tube core barrels. Larger sizes and special designs as required. In order to fill orders promptly for either single- or double-tube reaming shells we must know the make and model of the core barrel.

CASING-SHOE BIT

Available in the same wide range of sizes and types as our standard casing bits and designed so that they can be left on the end of the casing in the hole while drilling is continued through them with the corresponding standard size of core barrel and bit.

STANDARD CASING BIT

Available in all standard sizes with a choice of four different matrices and three different grades of selected diamonds. Larger sizes and special designs furnished as required. Must be removed before continuing to drill with core barrel and bit.

STANDARD CORING BIT

Available in four different matrices and three different grades of correctly-sized diamonds, EX, AX, BX and NX sizes carried in stock. Larger sizes and special designs furnished to meet any specifications or requirements.

IMPREGNATED CORING BIT

Especially suitable for drilling through hard, broken or extremely abrasive ground, where diamond loss from surface-set bits might be excessive. EX, AX, BX and NX sizes carried in stock. Larger sizes and special designs as required.

ORIENTED DIAMONDS

Make Sprague & Henwood Bits

CUT FASTER . . . LAST LONGER

Always a leader in its field, Sprague & Henwood, Inc. PIONEERED the development, and the production on a commercial scale, of "ORIENTED" Diamond Bits: in which each individual diamond is set with its hardest rib or "vector" toward the work.

We have produced THOUSANDS of oriented bits, in a wide variety of types and sizes—with both cast- and powdered-metal matrices—and have proved, by extensive comparative tests in our own contract drilling operations, that they cut much faster and last much longer than bits in which the diamonds are set at random.

Natural aptitude, special equipment and long training are necessary before a setter can be relied upon to orient diamonds correctly in the mold but we are now fully organized to produce CERTIFIED ORIENTED DIAMOND BITS efficiently and will quote money-saving prices promptly on request.

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is a very important phase of our business. This includes exploratory drilling for coal and ore—also foundation testing for bridges, dams and other heavy structures. Experienced crews and supervisors are available for service anywhere in the United States and many other countries. Estimates submitted on request.

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SERIES "M" CORING BIT

For use with Series "M" Double Tube Corebarrel as developed by Sprague & Henwood, Inc. to meet the need for a higher percentage of core recovery from soft, broken or friable material than can normally be obtained with a standard double-tube corebarrel. Available in all four types of matrix and three different grades of diamonds. Also in a complete range of "impregnated" type bits. EX, AX, BX and NX sizes carried in stock.

"CONCAVE" TYPE NON-CORING BIT

Especially suitable for drilling round smooth holes in relatively soft formations, when cores are not required. All standard sizes available in four different types of matrix.

"PILOT" TYPE NON-CORING BIT

Recommended for drilling blast holes in hard formations and also for use when long straight holes must be drilled in variable formations.

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The fastest cutting bit for drilling blast holes in very hard formations. All standard sizes.

Lower Pumping Costs

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These Wilfley 8 inch Model "K" Sand Pumps are specifically designed for rugged, heavy duty service in a new coal preparation plant. These dependable, highly efficient pumps deliver continuous, trouble-free performance at low cost without media loss, leakage or dilution.

- Individual engineering on every application
- Cost-saving efficiency
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- Designed for simple installation
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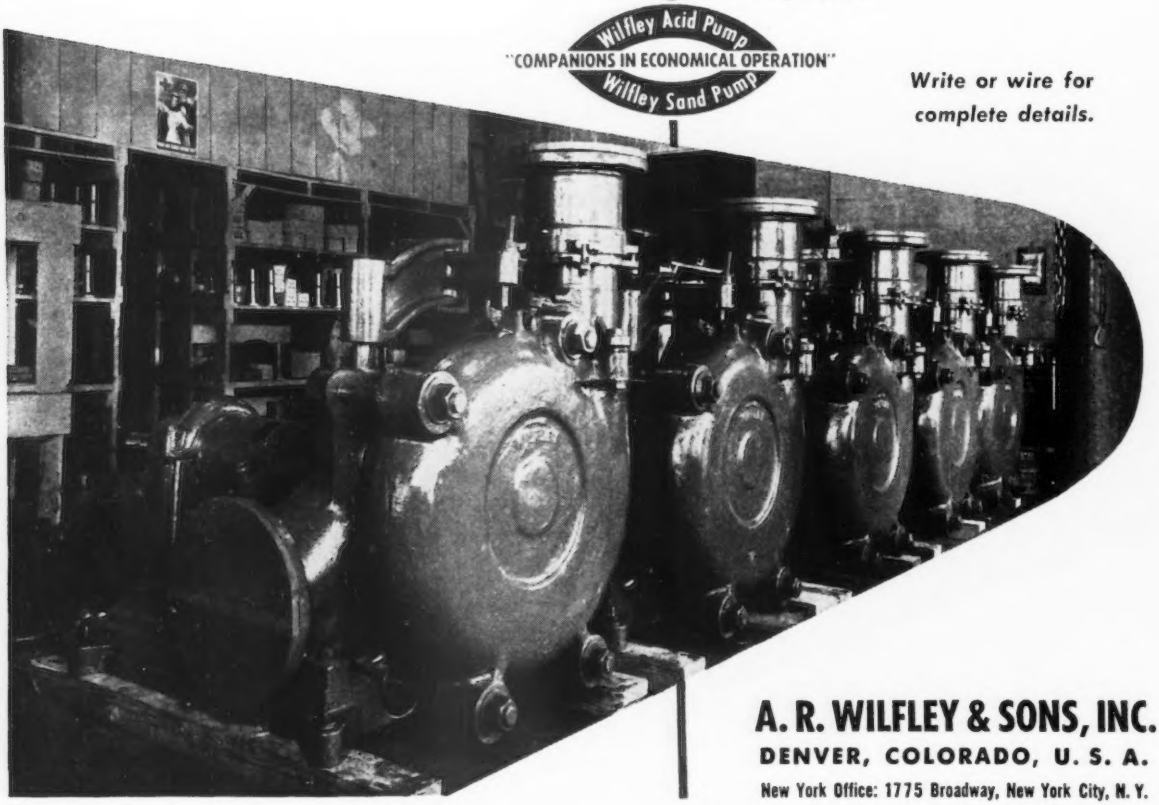
Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

Write or wire for complete details.



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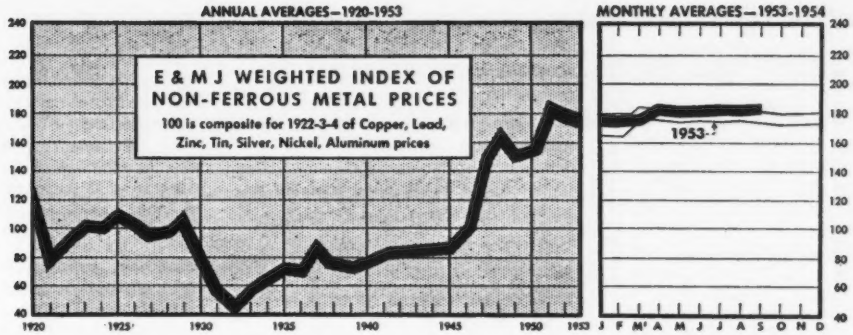


MARKETS

Labor troubles, U.S. stockpile buying, and higher London prices strengthened copper, lead, and zinc in all markets. The E&MJ index of non-ferrous metal prices rose to 186.56 for September, against 184.65 in August.

There's no real shortage of metal in prospect, however, providing mines can get back into production. Nor is a copper price rise likely in the U.S. unless strikes continue to keep mines closed.

Copper production in both the U.S. and Chile is off sharply owing to work stoppages. Fabricators who counted on an easy fourth quarter situation will be going begging until struck mines reopen. There is no sign of a desire by producers to force a higher price, however.

Echoes of a squeeze in London's speculative market reverberated around the world, seriously embarrassing the London Metal Exchange as a pricing medium. At one time, copper moved up to the equivalent of about 36c per lb in that market. The U.S. price held at 30c.

Booming quicksilver prices are quite likely to lose their zip well before the end of the year as offerings increase.

Rumor had it, at September's end, that the British government was approached to use stockpiled copper to cool off steaming London copper markets. The effort fell flat, as did similar attempts in the U.S.

●

AT HOME

Both certain industries and certain areas in the U.S. are doing very well while others flounder. The result is an apparent stability in the economy that isn't all it seems. It will take wise handling by both industry and government next year to keep things on an even keel.

The steel rate, of prime interest to mining, seems, however, to be a pretty safe bet for a rise to 75% by the end of the year. Considering the steel industry's growth recently, the use of 75% of its total capacity would be good, indeed, by normal standards.

Best guess is that the economic pattern of the recent past will hold into next year, with strength in some industries (including metal mining), weakness in others, balancing out to a fairly stable economy.

Lead and Zinc, now in a comeback, should advance further unless the tinkering the market's getting spoils it. One Western lead-zinc mining community is being rebuilt in anticipation.

The industrial market for uranium might be about 14,000 tons of metal yearly by 1975, according to Jesse Johnson, speaking at the AMC meeting. He feels this could be obtained at a price as low as $10 per lb.

●

ABROAD

Sherritt-Gordon's version of the Chemico high-pressure, high-temperature ammonia leach and acid precipitation for nickel and cobalt is doing well. Start-up problems, largely mechanical, have been overcome and capacity output of the company's refinery is expected before the end of the year.

MARKETS—Trends and Prices

Copper Trade Upset as Strikes Reduce Output—Lead and Zinc Prices Higher Here and Abroad

WORK STOPPAGES at mines here and abroad continued to upset normal trading relations in copper to a considerable degree, and to a lesser extent in lead and zinc. General business activity improved as the fall season set in, which was reflected in a rising rate of production in the steel industry to 68.9% of capacity as September ended, against 64% a month previous.

Strikes ended during the month at the El Paso copper refinery of Phelps Dodge, the Miami Copper properties, Consolidated Coppermines, and International Smelting & Refining Co. But a strike was called at Asarco's Garfield smelter and at Kennecott's Garfield refinery. Anaconda's Montana mines, refineries and fabricating units remained closed because of labor demands, and plants of American Brass at Torrington, Ansonia, and Buffalo also were down. Kennecott's Utah mine went on a 4-day basis, beginning Sept. 27, owing to strikes at the Garfield smelter and refinery, but production at the company's Chino property was stepped up to a 7-day basis. As September ended it was announced that negotiations for a settlement were scheduled to resume on Oct. 5.

Copper mines in Chile were all down on strike for a time and the situation almost got out of hand. On Sept. 20 President Ibanez decreed a "state of siege," which brought the workers back into the mines at the three major properties—Chuquicamata, Potrerillos, and El Teniente. Suspension of work at Chuquicamata was of short duration, Potrerillos was down for 24 days, and El Teniente for about a month. The loss in production finally caused the Banco Central to withdraw as a seller.

Major nonferrous metals were firmer in all markets. The Government's purchases of lead and zinc absorbed good tonnages and prices named by producers were higher. Though foreign copper advanced sharply, U. S. producers held to the 30c delivered basis all month. Tin averaged a shade higher than in the preceding month. The month's price changes caused the *E&MJ* price index for September to rise 1.91 points to 186.56. This compares with 181.10 a year ago.

Copper supplies available for fourth quarter delivery have been reduced by the strikes to the extent that some domestic consumers have indicated that their production schedules will have to be cut back. They have appealed to the authorities in Washington for deferment of deliveries of copper to the stockpile to relieve the situation. For political reasons these demands were turned down. Except for the fact that the current domestic quotation for copper of 30c a pound is viewed as high in the light of increasing competition with aluminum, the price might easily have risen by several cents a pound.

An excited London market upset trading in foreign copper in all markets. A bad squeeze on the London Metal Exchange sent the asking price on Sept. 29 to £287½ per long ton, equivalent to a shade under 36c per pound. The stocks of copper available to traders on the Exchange were too small for the job of maintaining an orderly market. The spread between cash and three months was £16 per ton as September ended.

Stocks of refined copper in the hands of U. S. producers have declined from 125,759 tons at the end of March, the high for the year, to 58,387 tons at the end of August, according to Copper Institute. Stocks held outside of the U. S. have dropped from 279,804 tons at the end of March to 172,326 tons at the end of August. Deliveries of Chilean copper to the U. S. stockpile accounted for a fair share of the decline in stocks of foreign metal this year.

Consumer and stockpile buying of domestic lead continued at a rate sufficient to strengthen the price structure. The foreign market also was fairly active and a squeeze on the London Metal Exchange raised prices in that center appreciably. These developments caused the price in the U. S. to score a net gain of one-half cent for the month, establishing the quotation on the basis of 14¾c, N. Y. The rise to the top level began early on Sept. 15, but some business was booked at 14½c on that day and the *E&MJ* weighted average settled at 14.70c. On the following day and right through to the end of the month all sales made at a flat price were closed on the 14¾c basis.

Stocks of refined lead at U. S. refineries at the end of August totaled 84,429 tons, against 93,030 tons a month previous and 104,626 tons on June 30. Stockpiling has been a factor in reducing stocks.

Europe has been absorbing larger tonnages of lead at higher prices. On the London Metal Exchange the asking price of common lead moved up to £104 per long ton on Sept. 30, equivalent to about 13c a pound. Foreign origin lead was quotable at 12¾c a pound, f.a.s. Gulf ports.

Zinc advanced to 11½c, East St. Louis, early in September. The higher basis was announced on Sept. 3 by a custom smelter, but heavy selling took place on the 11c basis before the rise became effective throughout the industry. Our daily average didn't get up to 11½c until Sept. 8. The Government's purchase program for September absorbed between 15,000 and 20,000 tons of zinc, according to trade estimates. The American Zinc Institute's statistics disclosed that stocks declined 4,742 tons during August to 193,285 tons. Shipments totaled 76,535 tons, of which 61,298 tons went to consumers, 1,525 for export and 13,712 tons on Government account. Production for August was estimated at 71,793 tons.

Aluminum production continues at a high rate and the supply situation is such that substantial tonnages are moving into the stockpile at the same time that consumers are getting all of the metal they want. Production of primary aluminum for August was estimated at 125,296 tons, which compares with 126,162 tons in July, the record high, and 110,545 tons in August last year. Ingot aluminum, 99% grade, continued at 22.2c a pound.

Tin producers remain optimistic over the chances of getting the control plan into the operating stage before too long. A

Average Prices for September (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.700
Electrolytic, export, refinery	30.066
Lead:	
Common, New York	14.598
Common, St. Louis	14.400
Silver and sterling exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz.	73.239
Sterling Exchange, "Checks"	280.080
Zinc:	
Prime Western, East St. Louis	11.408
Prime Western, delivered (g)	11.908
Tin:	
New York Straits	93.535
New York, 99% min. (e)	92.535
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$311.000
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus, ingot	22.200
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in cases f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 106

communique issued after the recent meeting of the Interim Committee said: "In the light of statements made by delegations it is hoped that the necessary ratifications or acceptances of the International Tin Agreement will be received in time to enable the first meeting of the Council to be held about the end of 1954."

Quicksilver made a new high at $325 per flask, N. Y. Rumors that new important uses have been found for the metal could not be confirmed.

Buying of manganese and chrome ores showed no improvement. Lower prices were named on both ores.

"Free" Gold Market

Prices for gold in the "free" market were generally stable during September. The volume of business showed moderate improvement. London regained much of its activity as a result of the decline in sterling. Pick's World Currency Report quotes on "free" gold, per fine oz, as follows:

	COINS		BARS (12.5 kg.)	
	Aug. 31	Sept. 30	Aug. 31	Sept. 30
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$41.50	$41.25	38.00	38.10
HONG KONG	41.50	41.00	37.95	38 05
BOMBAY	50.50	48.50	49.50	47.75
TANGIER	40.85	41.50	35.10	35.05
BEYROUTH	41.95	42.25	35.25	32.25
PARIS	42.15	41.85	35.65	35.85
BUENOS AIRES	41.00	41.30	38.40	38.25

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Sept. 1954	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	29.700	29.650	93.000	14.250	14.050	11.500	11.000
2	29.700	29.600	92.625	14.250	14.050	11.500	11.000
3	29.700	29.700	92.750	14.250	14.050	11.540	11.040
4	No Market	29.625	92.750	14.250	14.050	11.515	11.015
6	Holiday	29.625	Holiday	Holiday	Holiday	Holiday	Holiday
7	29.700	29.625	93.250	14.500	14.300	11.655	11.155
8	29.700	29.675	93.250	14.500	14.300	12.000	11.500
9	29.700	29.600	93.500	14.500	14.300	12.000	11.500
10	29.700	29.750	93.500	14.500	14.300	12.000	11.500
11	No Market	29.675	93.500	14.500	14.300	12.000	11.500
13	29.700	29.675	93.875	14.500	14.300	12.000	11.500
14	29.700	29.725	93.750	14.500	14.300	12.000	11.500
15	29.700	29.625	93.500	14.700	14.550	12.000	11.500
16	29.700	30.075	93.750	14.750	14.550	12.000	11.500
17	29.700	30.200	94.000	14.750	14.550	12.000	11.500
18	No Market	29.625	94.000	14.750	14.550	12.000	11.500
20	29.700	29.900	93.875	14.750	14.550	12.000	11.500
21	29.700	30.075	93.625	14.750	14.550	12.000	11.500
22	29.700	30.425	93.750	14.750	14.550	12.000	11.500
23	29.700	30.175	94.125	14.750	14.550	12.000	11.500
24	29.700	30.875	94.000	14.750	14.550	12.000	11.500
25	No Market	30.375	94.000	14.750	14.550	12.000	11.500
27	29.700	30.500	93.500	14.750	14.550	12.000	11.500
28	29.700	30.625	93.250	14.750	14.550	12.000	11.500
29	29.700	32.000	93.625	14.750	14.550	12 000	11.500
30	29.700	31.325	93.625	14.750	14.550	12.000	11.500
AVERAGES FOR MONTH							
Sept.	29.700	30.066	93.535	14.598	14.400	11.908	11.408
AVERAGES FOR WEEK							
Sept.							
1	29.700	29.563	92.938	14.250	14.050	11.500	11.000
8	29.700	29.642	92.925	14.350	14.150	11.642	11.142
15	29.700	29.675	93.604	14.533	14.342	12.000	11.500
22	29.700	30.050	93.833	14.750	14.550	12.000	11.500
29	29.700	30.758	93.750	14.750	14.550	12.000	11.500
CALENDAR WEEK AVERAGES							
Sept.							
4	29.700	29.608	92.729	14.250	14.050	11.509	11.009
11	29.700	29.658	93.400	14.500	14.300	11.931	11.431
18	29.700	29.821	93.813	14.658	14.467	12.000	11.500
25	29.700	30.304	93.896	14.750	14.550	12.000	11.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Sept. 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold (d) London	Gold (d) United States
1	280.5625	85.250	73.750d.	249s. 10½d.	$35.00
2	280.5625	85.250	73.750d.	249s. 10d.	35.00
3	280.5625	85.250	73.750d.	249s. 10½d.	35.00
4	(e)	(e)	(e)	(e)	35.00
6	Holiday	Holiday	73.750d.	250s. 0d.	Holiday
7	280.5000	85.250	73.750d.	250s. 1½d.	35.00
8	280.5000	85.250	73.000d.	250s. 2d.	35.00
9	280.6250	85.250	73.000d.	250s. 2d.	35.00
10	280.6250	85.250	73.000d.	250s. 1d.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	280.6875	85.250	73.000d.	249s. 11½d.	35.00
14	280.4375	85.250	73.000d.	249s. 11½d.	35.00
15	280.1250	85.250	73.000d.	250s. 1½d.	35.00
16	280.0625	85.250	73.000d.	250s. 8d.	35.00
17	280.0625	85.250	73.000d.	250s. 5½d.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	280.0000	85.250	73.000d.	250s. 7d.	35.00
21	279.9375	85.250	73.000d.	250s. 8d.	35.00
22	279.9375	85.250	73.000d.	250s. 8d.	35.00
23	279.6250	85.250	73.000d.	250s. 9d.	35.00
24	279.5000	85.250	73.000d.	251s. 2d.	35.00
25	(e)	(e)	(e)	(e)	35.00
27	279.0625	85.250	73.250d.	251s. 4d.	35.00
28	279.0625	85.250	73.250d.	251s. 5½d.	35.00
29	279.5625	85.250	73.500d.	251s. 4d.	35.00
30	279.6875	85.250	73.500d.	250s. 8½d.	35.00
AVERAGES FOR MONTH					
Sept.	280.080	85.250	73.239	—	35.00
AVERAGES FOR WEEK					
Sept.					
1	280.575	85.250	—	—	—
8	280.531	85.250	—	—	—
15	280.500	85.250	—	—	—
22	280.000	85.250	—	—	—
29	279.363	85.250	—	—	—

Calendar Week Averages, New York Silver: Sept. 4th, 85.250; 11th, 85.250; 18th, 85. 250; 25th, 85.250.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our "export" quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines...

G. P. Lutjen

Notes on the Back of a Mining Show Program

San Francisco might well be defined as a beautiful city entirely surrounded by magnificent view. The vista at sunset from the Golden Gate Bridge, the Top of the Mark, or practically anywhere in town, could easily replace motion pictures as your best entertainment. More than this, there is an air about the town that makes it a pleasure just to stroll around the streets. As a matter of fact, such a stimulus is necessary for citizens going around and about on foot because the city has been laid out on the basis of an old roller coaster design. Out-of-towners who go in for hiking will find pedestrianism (or is it pedestry?) unique in San Francisco. If you cross a street at the corner (and you had better because the local constabulary gives jaywalkers a real bad time), autos and other vehicles actually stop for you. Incredibly, there is no horn-blowing, no profanity, not even a small jolt from a fender. As nearly as we have been able to observe, if the inhabitants of Chicago, New York, Philadelphia or Los Angeles practiced pedestrianism in such a manner, they would die like flies.

Every San Franciscan seems to be a member without portfolio of the Chamber of Commerce. Even the taxi drivers, who in most metropoles are a cynical lot given to abusing local institutions from the mayor to the baseball team, are enraptured with San Francisco. Where else could you find a hackie like Thomas Corry, who takes his fares downtown by way of a florist shop? "Best in the world", he says, "and it will only take you five minutes." The ensuing tour of Podesta and Baldocchi's, which may well indeed be the best florist in the world, is five minutes worth of pure delight capped by a corsage for the lady in the party with the compliments of the management. Hospitality, thy name is San Francisco.

For the gourmet, or even the I-like-plain-good-food type diner, the Golden Gate is Shangri La. No city in the nation, with the possible exception of New Orleans, has so many restaurants where really fine food is dispensed in such agreeable atmosphere. We heartily recommend last month's issue of *E&MJ* containing "Food and Fun in San Francisco" as a prime reference work for any future sojourns westward that you may be planning. Singling out any one item in the Meat and Drink Department is extremely difficult, almost impossible, but we would be remiss if we didn't suggest that you try the Scorpion served at Skipper Kent's. This delicious beverage is served in a china vessel that compares favorably in size with a soup tureen. Floating around amid a score of ice cubes is a gardenia. This exotic concoction is apparently limited to one to every three customers so three overgrown straws are provided for convenient sipping. (No bubble blowing please.) If you plan to try this rum drink, send for our Handy-Dandy Scorpion Kit: contains one crimper, suitable for crimping companions' straws; one ribbon for securing gardenia behind ear; one identification card for pinning on lapel with instructions for mailing you home.

Cable cars come close to restaurants as a ranking attraction in San Francisco, and riding down hill on one of these conveyances is an intoxicating experience or vice-versa. We know of one bon vivant who put up a $50 deposit for a cable car plus 500 ft of track.

From here on in count us among the would-be coast dwellers. San Francisco, olé!

The Mining Show, cause celebre pro temps, attracted some 5,000 registrants who eyed, touched, discussed, operated and otherwise messed around with equipment that made up one of the best exhibitions yet. We think exhibitors and visitors alike owe congratulations to Julian Conover, Jack Fox and their colleagues at the Mining Congress for making the show so worthwhile. We would like to comment on the papers presented but we were so busy eyeing, touching, discussing, operating and otherwise messing around with equipment that we never got to a meeting room. Fortunately, others on the *E&MJ* staff kept their wits about them and covered the technical sessions. Highlights of these are presented on p 104.

A large chunk of uranium ore on exhibit at the Crucible Steel Company of America booth was one of the stars of the show. Crucible Steel offered a nifty radio to the man, woman or child that guessed closest to the rock's value per ton. Almost everyone took a guess, from Charlie Steen to a plumber who came in to fix a leaky faucet in the Men's Room. Winner was Oscar Glaeser of U.S. Smelting Refining & Mining with a guess of $85. Actual figure was $84.60.

One prominent and highly successful uranium miner probably kicked himself all the way back to Colorado. He first guessed $85, later changed to a figure more than twice as high. More than adequate consolation however, is the fact that he knows uranium where it counts—in the ground.

Other important business transacted in San Francisco, hereafter known as The City, was a meeting of the *E&MJ* Chowder, Marching and Margaret Sullavan Society, held under a pier at Fisherman's Wharf. Chief item on the agenda was election to full membership of Margaret Ralston, chief of McGraw-Hill's Pacific Coast News Bureau who offered the Society a motto it could live with, free of charge: "One must be prepared to cope at all times". The election was almost unanimous, the lone dissenting vote coming involuntarily from the Treasurer who inadvertently sat on an only partially stuffed crab after the "ayes" voted. In a brief acceptance speech, Miss Ralston left us with this thought; "IF you can keep your head when all about you are losing theirs,—maybe you just don't understand the situation."

ENGINEERING AND MINING JOURNAL

OCTOBER 1954

Does Lead-Zinc Stockpiling Really Help?

WITH THE COMMENDABLE OBJECTIVE of helping domestic lead and zinc miners, the Administration announced some weeks ago a program of stepped-up stockpiling of lead and zinc.

The program was billed as a strategic necessity, but it was patently a substitute for the added tariff protection desired by U. S. lead-zinc miners.

The Administration sided with the State Department in feeling that a tariff rise now would greatly damage relations with friendly neighbors. It therefore rejected the Tariff Commission's recommendations for a lead-zinc tariff increase, but devised the stockpile move in an attempt to keep the political favor of western miners by bolstering lead-zinc markets.

Because this action's consequences will reach far into the mining industry's future, it's worth considering just what the Administration has done, and also what it might have done.

By agreeing to stockpile "excess" lead and zinc with the express purpose of stiffening their domestic markets, the Government has smashed the only solid basis for stockpiling, namely, strategic necessity. If this idea is accepted, there is no reason why Government should not also stockpile "excess" shoes, television sets, or even automobiles, if it should become necessary in order to stiffen domestic markets. Butter, of course, is being stockpiled, and the others could be. The "excess" stocks could always be sold at a price in the depressed areas of the world.

Aside from thus opening the door to extended government merchandising, this lead-zinc stockpile action simply puts the industry just a little more deeply in the Government's power. This is so obvious, there is no point in detailing it, but it should not be overlooked.

Sure, lead and zinc prices have stiffened somewhat, but at what a cost! And what will lead and zinc prices do when the stockpile support is removed, as some day it must be?

There is at least a possibility that in the long run the Administration's action will have done the industry more harm than good.

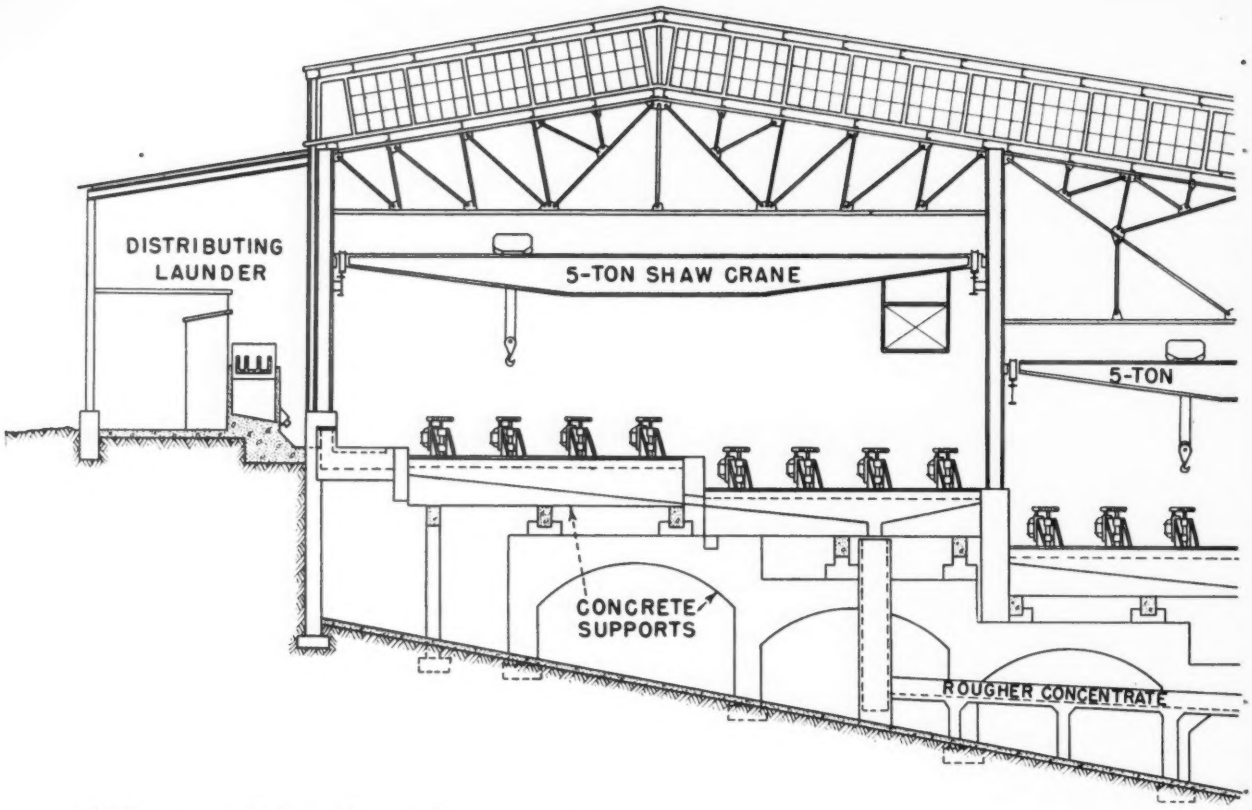
What could have been done instead? For one thing, the Administration could simply have accepted the Tariff Commission's recommendations. This would have solved the domestic political problem. If reasonable, the tariff would not have greatly injured foreign metal producers, and it would not have established the dangerous principle of using government stockpiling as a market influence.

Now, however, we face the impossible job of trying to convince foreign metal producers that they should not take "unfair" advantage of U. S. stockpiling by sending "undue" shipments of metal into U. S. markets.

What an unfair position this puts the foreign producer in! If he brings in substantial shipments of metal, he is a cad, by definition. If he positively holds off, he is no businessman and his board of directors will fire him.

All in all, it seems that part of the mining industry is slipping deeper into the dangerous fog that envelops so much of the agricultural industry.

Our only opinion is that while eventual tariff reduction is a sound goal, one can pay too high a price in trying to reach it quickly. The cushions of stockpiling are soft and attractive, but when piled higher and higher they can smother those who lie on them.



How Utah Copper Remodeled Two 50,000-Ton Mills Without Shutting Down

JOHN B. HUTTL
Associate Editor

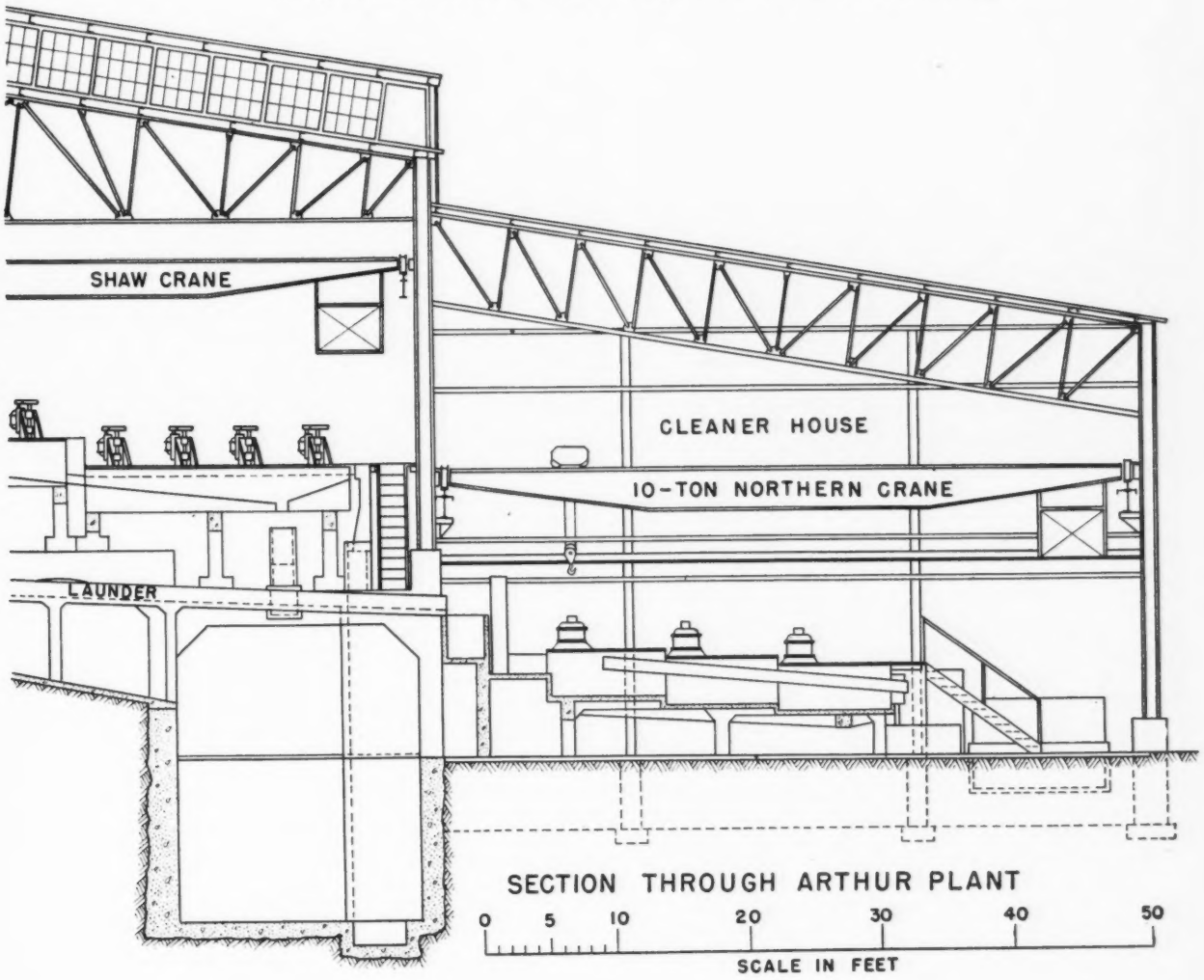
THIS IS THE STORY of how the Utah Copper Division of Kennecott Copper Corp. remodeled the flotation departments of its Magna and Arthur concentrators in the record time of a little more than eight months to bring about higher recovery of vitally needed metals. The achievement is all the more remarkable in that the work was carried out in giant plants, each capable of treating up to 50,000 tons of ore a day, without interruption of production during a period of world tension and increased demand for copper and molybdenum. It is also an outstanding example of good planning and engineering on the part of the metallurgical, mechanical, and construction departments and proper synchronization of the diverse erection activities during the construction period.

The new flotation system now operating successfully in the concentrators mentioned, comprising new and larger flotation machines and flow revisions, is the outgrowth of several years of research for the increased recovery of minerals from ore mined in the company's open pit at Bingham, particularly molybdenite. Flotation practice before adoption of the present system involved treatment in a rougher circuit to produce a copper-molybdenite rougher concentrate, cleaning, and subsequent separation of molybdenite from the copper minerals in the molybdenite recovery plant. Cleaner tailings were returned to the head of the rougher machine.

At the Arthur concentrator the equipment used consisted of 9 rougher cells per row, with concentrate produced by the cells cleaned in 3 cleaner cells. Total number of rows in operation was 58, and capacity of each row about 800 tons.

Equipment at the Magna concentrator comprised 10 rougher cells per row, the concentrate produced by the first 5 cells being cleaned in a cleaner cell, and the middlings from the 5 cells following being returned to cell 1. Number of rows totaled 56, and capacity per row 800 tons. The cells used were Fagergren 56-in. step down type units. Cell bodies at the Magna plant were concrete, and those at the Arthur plant, steel. Sodium dicresyl-

Huge change-over to larger concrete flotation cells at Magna and Arthur mills completed in about 8 months.

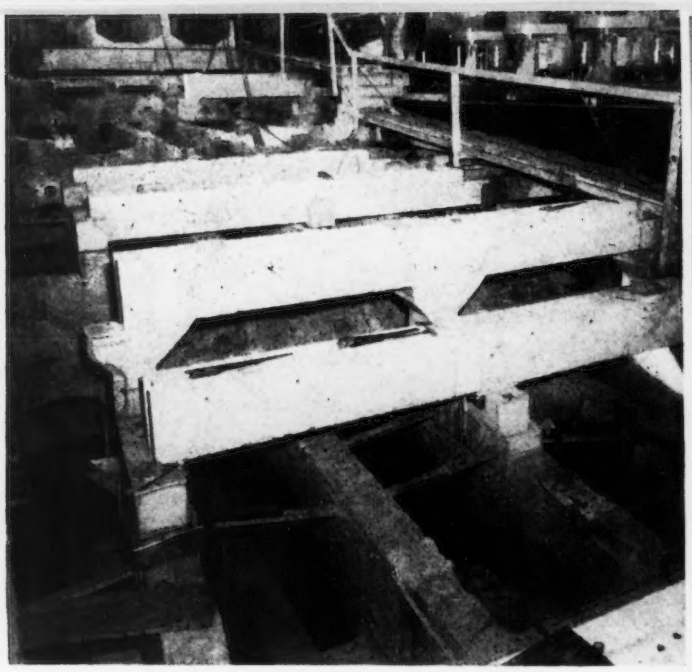


dithio-phosphate was used as a collecting agent for floating a good portion of the molybdenite along with the copper. Recovery of molybdenite in the copper flotation circuit was less than 80%.

To improve this figure, extensive laboratory and plant experimental work was instituted in 1937, and numerous collecting agents and combinations were tried. Results invariably showed that any reagents used in the copper circuit and found effective in raising molybdenite recovery would affect copper recovery adversely. Burner oil was found to be a most effective reagent, but its addition to the circuit, even when added to the last cell or two of each row, always hurt copper recovery. Attention was then directed to the possibility of retreating tailings from the copper circuit in a separate row of cells to avoid interference with copper recovery and permit use of any reagent specific to molybdenite flotation. Accordingly, preliminary plant experimental flotation tests were conducted during the latter part of 1947 and thereafter. The work done at the Arthur plant involved pumping tailings from one 9-cell row to another 9-cell row, the latter acting as a retreatment row. A series of tests followed to determine the most satisfactory reagents and also the number of retreatment cells needed. It was found that the practice under test materially improved molybdenite recovery as well as raised extraction of copper, gold, and silver.

Research also pointed to the advantages offered by use of a row of flotation machines longer than those in operation. However, in studying the problem it was found that if the 56-in. unit were selected, enlargement of the Arthur flotation plant would be costly. Instead, two trough-type machines were investigated. Both had greater tonnage capacity, and because of their greater compactness installation of a larger number of machines in a given space was possible. After test work, the Wemco-Fagergren 62-in. trough-type machine was selected.

The flotation equipment layout finally adopted and installed at the Arthur concentrator consists of 16 cells per row arranged in four tiers, each tank containing 4 cells. Copper-molybdenite rougher flotation is carried out in the first 8 cells, while the



Four Major Steps in the Huge Flotation Plant

1. **Concrete members** of two rows of old rougher flotation cells are removed to make room for larger trough units. **2.** **Precast concrete bents** are installed on old concrete foundations to support new pre-cast flotation troughs.

last 8 cells, the first cell being an emulsifier receiving burner oil, pine oil mix and frother, represent the retreatment circuit.

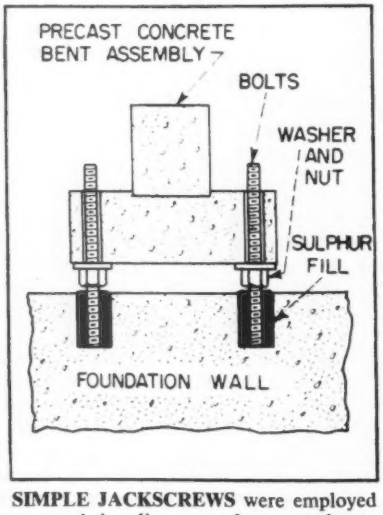
Concentrates produced by the two circuits are cleaned in separate cleaning machines, each made up of three Fagergren 56-in. step down type cells, preparatory to treatment in the molybdenite recovery plant proper. Tailings from the retreatment machine go to waste, while those from the cleaners, handling rougher copper-molybdenite concentrates and rougher retreatment concentrates respectively, return to the head of the copper circuit, and in equal amounts to the head of the retreatment circuit.

The Arthur concentrator now contains 45 rows of rougher circuits (two rows are for experimental purposes), each capable of handling 1000 tons plus; 23 rows of 3-cell cleaners; and 6 rows of 3-cell cleaners handling concentrates from retreatment circuits.

At the Magna concentrator, equipment layout differs in that the original 56 rougher (two are for experimental purposes) and cleaner circuits were retained and 6-cell retreatment units, the first cell serving as an emulsifier, and six rows of 3-cell cleaner circuits added. The machines used in the new additions are of the same design and capacity as those operating in the Arthur concentrator. Metallurgical results have come up to full expectation. Overall copper recovery has been increased from 0.75 to 1%, and molybdenite 10 to 12%. Research work to improve operations continues.

Manufacture and Installation of Cells

Reconstruction of the flotation departments of the Arthur and Magna concentrators along the lines described in the preceding account did not follow a standard pattern. This was because of different equipment layouts and needs. At Arthur the task involved removal of the 9-cell rougher rows of steel construction and subsequent installation of the 16-cell trough type units of precast concrete, while at Magna the only addition consisted of the 6-cell units for retreatment.

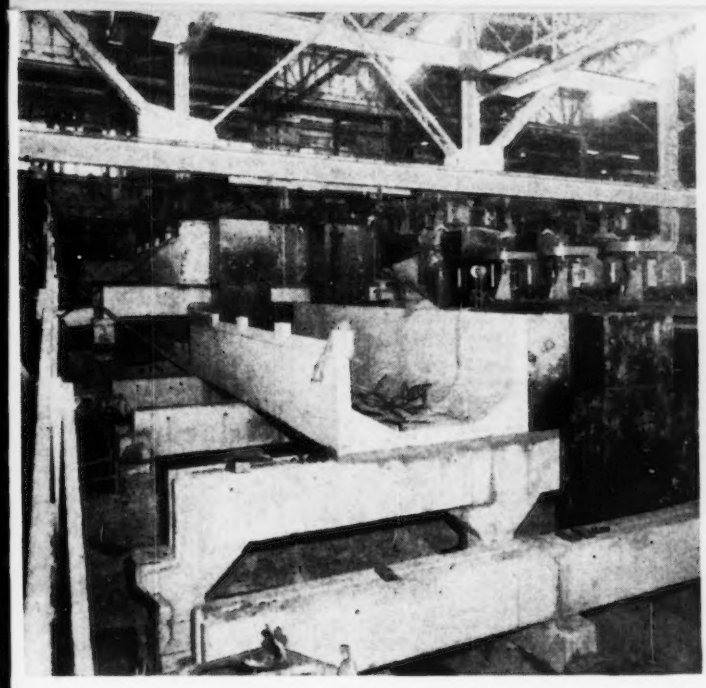


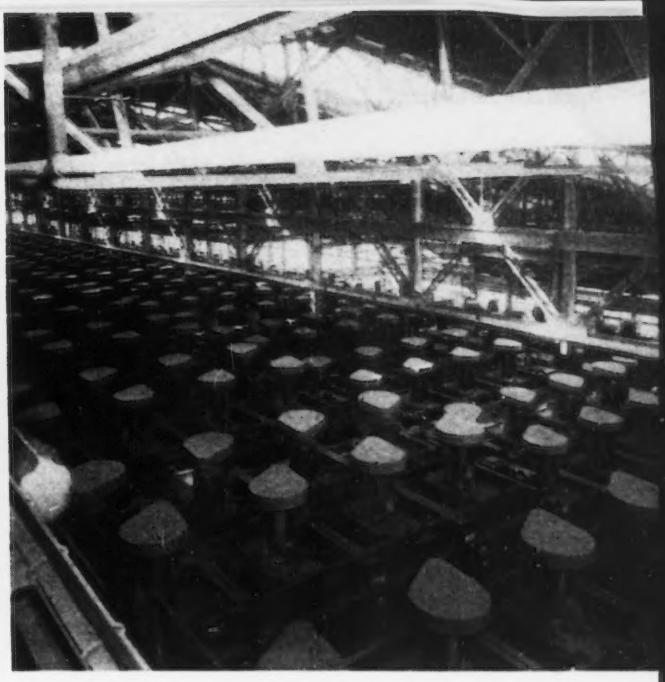
SIMPLE JACKSCREWS were employed to speed the alignment of concrete bents.

Here's how the Arthur revision was made: The job of the construction department was (1) to manufacture the precast concrete 4-cell troughs and bents or cross girders upon which they were to rest, and (2) remove the old rougher rows and install the new cell units and auxiliaries without interfering with milling operations. This was done with specially designed steel forms and by balancing removal and installation work.

The flotation bay in the concentrator contains two floors at different levels with cranes above. Thus, to avoid multiple handling of cell troughs and bents, identical sets of forms were used at the end of each floor. At these points all-welded baskets used as steel reinforcing in the manufacture of cell troughs were also made. Output per 8-hr shift was two baskets, with two men employed.

The steel forms used for the manufacture of celltroughs were designed to permit quick assembly, removal of finished troughs, and the placing of reinforcing wire basket and inserts. Concrete prepared at the central mixing plant was brought to the forms in mixer trucks, poured into the forms, and then treated with pneumatic vibrators to remove air. The concrete mix used contained six bags of cement per yd of concrete. Washed gravel was minus 1 in. Concrete curing compound made by A. C. Horn Co., Inc., was used for painting the inside of the forms. The number of men employed in pouring forms was four, and





Remodeling Job at Utah Coppers Arthur Mill

3. **Precast concrete troughs** are installed on aligned and grouted bents. Note steel discharge boxes at right.

4. **Huge battery** of Wemco-Fagergren 62-in. trough-type machines in operation after conversion of Arthur mill.

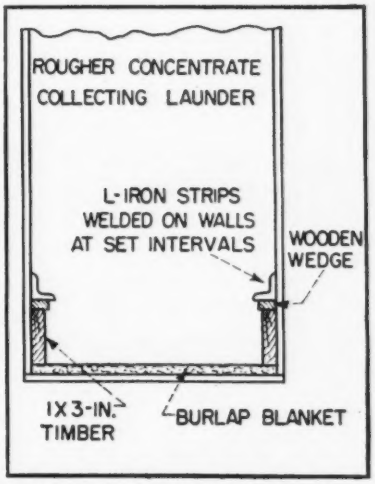
output per 8-hr shift was one cell trough.

Finished cell troughs were installed at time intervals determined by the mill department. In general, two old rougher rows were removed at a time and one new unit set in place after clearing and preparing bared foundations. The first two rows were removed on Sept. 11, 1952, and the first new unit was cut into the flotation circuit on Sept. 28, 1952. As the new cell units grew in number, the slight overloading of the rougher flotation circuit experienced at the start of construction work gradually diminished owing to the larger capacity of the new units as compared to those removed. The last two new cell rows were put on stream on July 1, 1953.

Preliminary work after removal of an old rougher row consisted of preparing the bared foundations for installation of the precast bents or girders and concrete rougher concentrate launder, generally with paving breakers. After the precast bents and launder were in place, the engineer aligned them at proper height and slope, followed by grouting with a mix consisting of one part cement and three parts screened sand. Simple jackscrews were used to speed alignment (see illustration.) The bolts were removed after placing of shims, and the holes in the concrete cross pieces holding the bent and space between foundation tops and cross pieces were filled with concrete.

Next, the first 4-cell section of the row was placed on the bents at the head of the circuit and leveled on about 1 in. of shims. This was followed by bolting the flanged steel feed and discharge boxes to the ends of the trough. Rubber gaskets between the trough ends and flanges formed a tight seal. The open spaces between the trough bottom and bent were closed by grout. The procedure described was repeated with the second, third, and fourth cell sections.

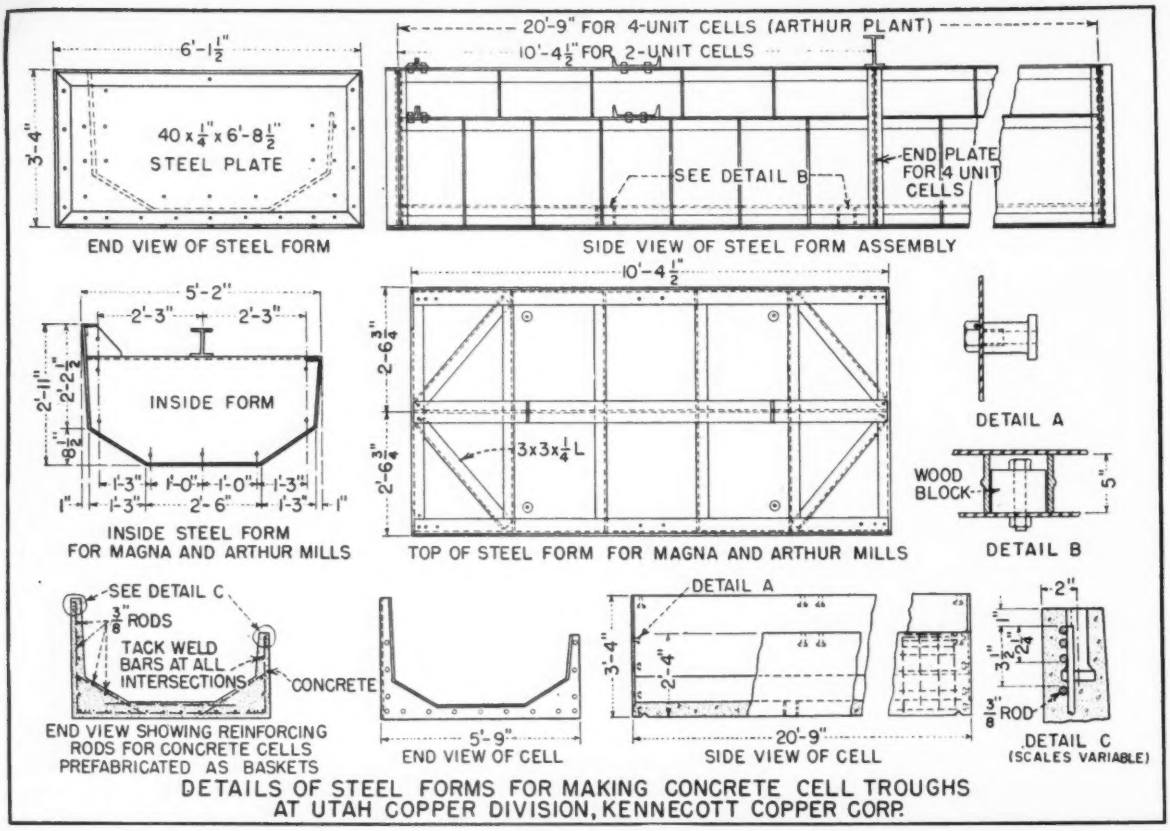
End operations consisted of placing motor supports, installing agitator mechanisms, setting and caulking the steel concentrate collecting launders to the sides of the cell troughs, and bolting the precast overflow lips along the sides of the cell troughs with a 3- to 4-ply burlap seal. The concentrate collecting launders discharging into the concrete launder leading to the cleaner section contain the blanket gold recovery arrangement shown. Installation of a complete rougher row required 6.35 days. The construction crew numbered 25 men. At the Magna concentrator installation of a 6-cell retreatment unit required 4.6 days.



BLANKET GOLD RECOVERY arrangement installed in launders.

An improved electrical distributing system was installed at the concentrators to take care of the larger power requirements of the remodeled flotation departments and other mill units. The new system at each concentrator consists of one primary substation having a normal capacity of 40,000 kva, receiving power at 44,000 v and transforming it to 13,800 v. This power is distributed to fifteen 2500-kva unit substations where it is stepped down from 13,800 v to 480 v. Unit substations with associated air-break switchgear are centrally located on each of the 12- or 13-mill sections and service fine crushing, grinding, and flotation departments. The other two substations service the coarse crushing sections and maintenance shops. The main 480-v secondary feeders are 600,000 cm, 3-conductor, rubber-insulated, neoprene jacketed cables installed either in conduit or open racks.

All power for milling operations is generated at the 100,000-kw central power station completed in 1948. The



DETAILS OF STEEL FORMS FOR MAKING CONCRETE CELL TROUGHS AT UTAH COPPER DIVISION, KENNECOTT COPPER CORP.

KEY TO THE SPEED OF THE CONVERSION JOB was careful planning and design of precast flotation troughs which had to be installed by the hundreds. Details of forms and reinforcing baskets for precast troughs shown above.

old flotation process consumed about 15% of the total power used by the Arthur concentrator. The 56-in. flotation machines then in operation were directly driven by 595 10-hp, 600-rpm standard vertical induction motors, and power to operate them was supplied from a substation receiving power at 44,000 v which was stepped down to 440 v. The agitating mechanisms of the 720 new and larger flotation machines now in operation are V-belt driven by individual 15-hp, 1800-rpm special high efficiency induction motors. Power input per machine is about 2.4 times that of the old machines.

In the flotation feeder circuit each motor of the 16 on each row of flotation machines is controlled by a combination line starter. A 3-conductor No. 10 rubber insulated, neoprene jacketed cable serves as a motor feeder. These feeders terminate in a watertight receptacle with the plug a part of the motor connection. This device expedites the changing of motors or agitating mechanisms. Flotation motors are controlled by a centrally located console with 128 push buttons arranged in 8 rows of 16 buttons. The stop buttons are arranged to be locked for protection of personnel.

CONCRETE FLOTATION TROUGHS SHOWN HERE were prefabricated in steel forms illustrated above. Troughs are reinforced with prefabricated steel baskets.

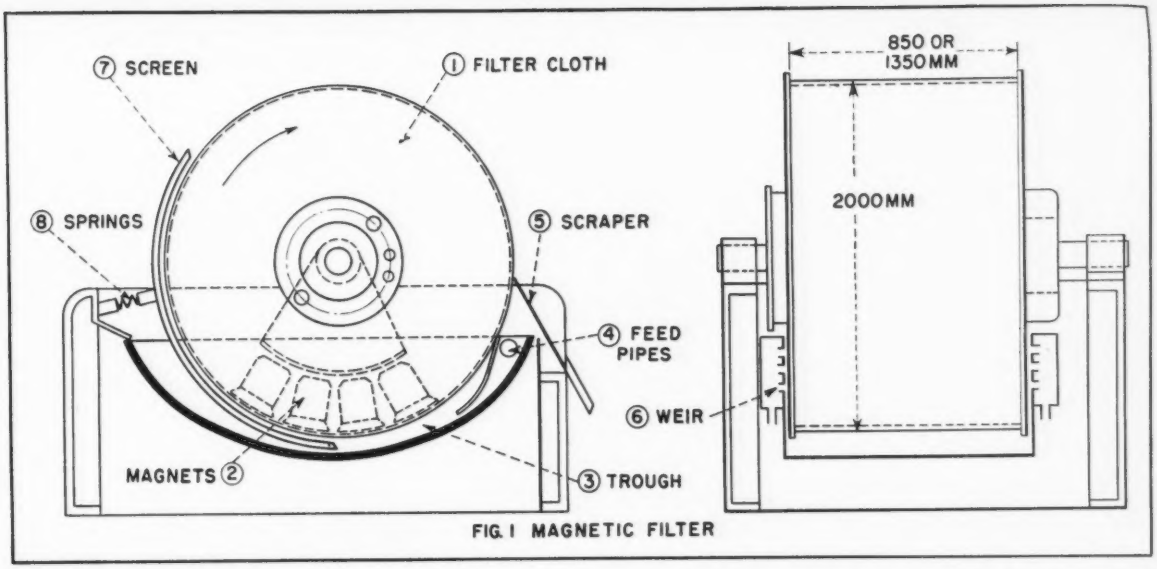


FIG. 1 MAGNETIC FILTER

AUTHOR BELIEVES MAGNETIC FILTER designed for magnetite concentrates could also be used in heavy-media plants.

High-Capacity Magnetic Filter Treats Magnetite Concentrates

BENGT G. FAGERBERG
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Luossavaara-Kiirunavaara
Malmberget, Sweden

A NEW MAGNETIC FILTERING DEVICE for magnetite concentrates has been developed during the course of the recent modernization program of Luossavaara-Kiirunavaara Co.'s old concentrator at Malmberget and the construction of a new plant. Details of this new unit are described in this article.

At Malmberget, concentrates produced by wet magnetic separation vary in size and quality as shown in Table 1, which also lists specific surfaces of the various products.

Settling Tanks Costly

Concentrates were previously dewatered by settling in twenty-four 1.5 m^3 steel shaking tanks. (See illustration.) Water content of the dewatered products depended upon fineness but averaged 12-15% (calculated in terms of *dry* material, as are all the moisture contents given here).

For several reasons, mainly because of excessively high costs of operation and maintenance, and unsatisfactory moisture contents in the dewatered concentrates, investigations were started to replace the shaking tanks with some more suitable dewatering device. The problem was difficult because it was necessary to find a device which would handle the coarse as well as the fine pulps which had to be delivered to the dewaterers in relatively dilute form.

Filter Replaces Shakers

Tests were carried out with shaking boxes and vacuum drum filters of Oliver type. Some of the shaking boxes were manufactured by the Swedish firm Morgårdshammars Mek. Verkstads AB (see illustration), and others were designed and manufactured by the Luossavaara-Kiirunavaara Co. They were operated at speeds of 645 and 1000 rpm respectively. The fast-moving boxes did not give any better results than the slow-moving ones. The more important results of the tests are summarized in Table 2 and graph of capacities, which show that the boxes could be used to treat the coarsest concentrates, and the filters for dewatering of the finest grade. Intermediate grades were too fine for the boxes and too coarse for the filters. Eventually it would have been worthwhile to have run tests with horizontal filters or inside filters of DorrCo type. However, it was felt that the use of these dewaterers would have been restricted to concentrates of limited grinds.

In the fall of 1949 work was started regarding the design of a dewaterer which would take advantage of the magnetic properties of concentrates. These investigations led to the building of a magnetic filter, which is essentially an ordinary vacuum drum filter, equipped with a magnet rack. The magnets attract and hold the concentrate at the filter drum, while the actual dewatering is done by vacuum. Two filters of this kind, 2x0.85 m and 2x1.35 m respectively, which have replaced the 24 shaking tanks previously used, have now been operating successfully for about six months.

Permanent Magnets Used

See Fig. 1 for essential details of the magnetic filter. It consists of a rotary filter drum covered with filter cloth (1). This operates with conventional vacuum and pressure phases of the rotary cycle. Stationary magnets (2) are mounted inside the drum as shown. Each pole is supplied with 110v 6-amp current. The magnets can also be of permanent magnetic material. Such a unit is now being supplied to Sala Maskinfabriks, AB., Sweden. The larger filter drum is driven by a 5-hp motor. Number of revolutions is nor-

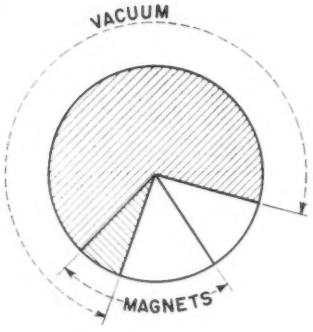


FIG. 2 ACTIVE RANGE OF VACUUM AND MAGNETS

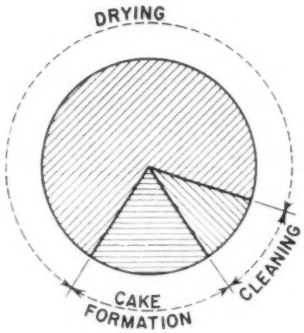
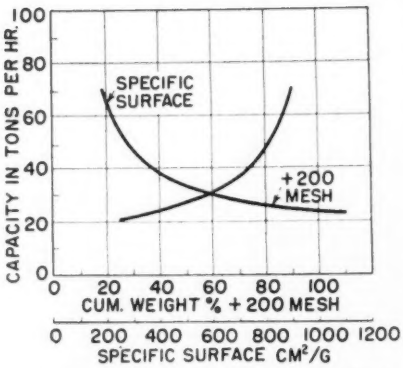


FIG. 3 RELATION BETWEEN CAKE FORMATION, CAKE DRYING AND FILTER CLOTH CLEANING TIMES



DEWATERING TESTS WITH MAGNETIC FILTER. CAPACITY AS FUNCTION OF FINENESS OF CONCENTRATE (SEE TABLE 3)

MAGNETIC CYCLE, vacuum phase, and cyclic operations performed by filter are shown above together with capacity graph.

mally about 2.5 per minute. The drum is lowered into a trough (3) to which the magnetite pulps are fed through pipes (4), placed under the cake scraper (5). Excess pulp runs off over an adjustable weir (6). On the emerging side, the filter cake is supported and simultaneously squeezed by a screen (7), hinged to the bottom of the filter trough. Pressure on the screen against the filter cake is regulated by springs (8).

More Drying Time

The effective range of magnets and vacuum is shown in Fig. 2. Fig. 3 shows how much of the total filter area is available for formation and drying of the filter cake and for cleaning the filter cloth. The long drying time (about 70% of the filter area as against a normal 50% in ordinary drum filters), affords greater capacity.

The most important property of the magnetic unit is its good capacity to filter both coarse and fine material. This is shown in Table 3 and graph of capacities, which illustrate the relationship between capacity and fineness. Moisture contents given are unnecessarily high because the vacuum pump used in the tests was rather worn. Under good vacuum conditions the filter has a capacity of 65-70 tons per hr equaling about 12-13 tons per hr per sq m of filter area when dewatering A200 concentrate to 8% moisture. For dewatering of A9 concentrate to 9.5% moisture, the capacity is 25-30 tons per hr equaling about 5 tons per hr per sq m. Capacity of an ordinary drum filter of Oliver type dewatering an A9 concentrate with a moisture content at entry of about 40% is about 1 ton per hr per sq m.

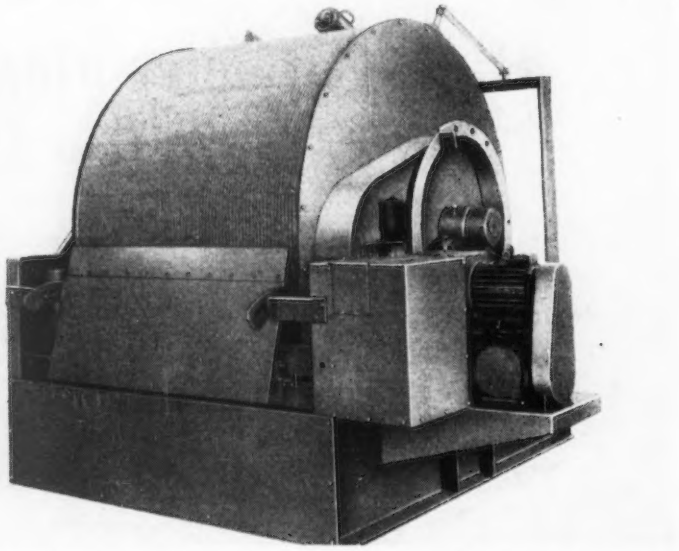


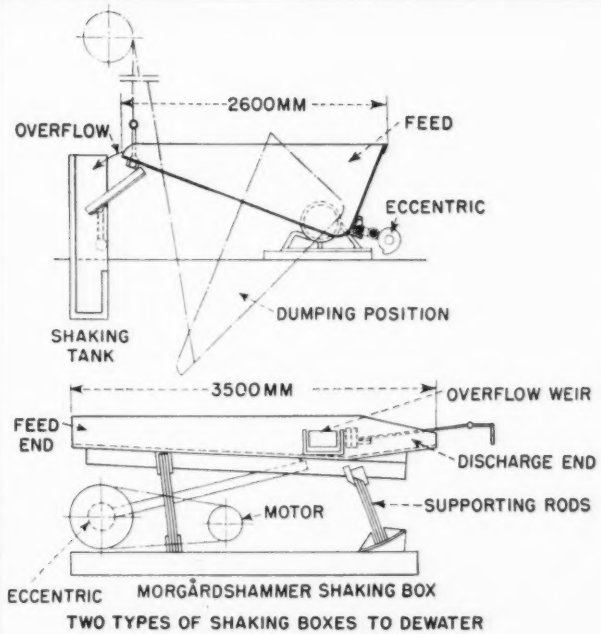
FIG. 4. MAGNETIC FILTER made by Sala Maskinfabriks, AB, is now in operation in Finnish concentrator. This unit is equipped with permanent magnets.

The filter works independently of the dilution of the feed. The reason for this is, of course, that the filter itself thickens the concentrate pulp by attracting the magnetic particles to the filter drum. Surplus water then runs out over the outlet in the filter trough. This is illustrated by Table 4, which shows that the capacity for dewatering a concentrate of a grind resembling the A9 was fairly constant although the feed pulp dilution varied from 70 to 45% solids.

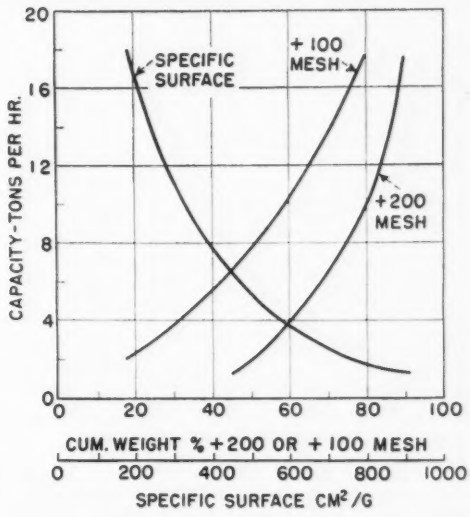
It is often advantageous to run the filter with some overflow, since the finer gangue particles are then removed as slime, and the grade of the concentrate is improved. This is illustrated by Table 4, which shows that the overflow, at a feed pulp density of 47.7% solids, contained about 260 kg slimes per hr, assaying 25.9% Fe and 1.74% P. The phosphorus content of the concentrate was thus reduced from 0.059 to 0.042%.

Easy To Operate

The filter is easy to operate and requires relatively little maintenance. The only part that is exposed to any considerable wear is the filter cloth. A filter cloth of wool, for instance, must be replaced after it has been



TWO TYPES OF SHAKING BOXES TO DEWATER MAGNETITE CONCENTRATES AT MALMBERGET.



CAPACITY OF MORGARDSHAMMER SHAKING BOX AS A FUNCTION OF FINENESS OF CONCENTRATE.

Table 1. Data on Magnetite Concentrates

Conc.	Cum. weight % +14 mesh	+28 mesh	+48 mesh	+100 mesh	+200 mesh	Fe %	P %	Approx. Specific Surface cm²/g	Feed Pulp Density % solids
A 200	10	34	62	79	90	66.0	0.20	200	
A 30		2	19	57	79	70.0	0.03	350	65 –
A 10			1	20	54	71.5	0.01	700	50
A 9				8	44	71.7	0.009	950	

Table 2. Dewatering Tests With Shaking Boxes and Oliver-Type Drum Filters

SHAKING BOXES
Type: Morgårdshammar
Dimensions: 3500 x 1200 mm
Strokes per minute: 645
Angle of throw: 13 deg 20 min
Length of stroke: variable

DRUM FILTERS
Dimensions: 1600 x 2400 mm
Vacuum: 40 cm Hg
Filter cloth: wool
Speed: 0.86 rpm
Pulp density: 40% solids
Pulp temperature: 25 deg C

	Tests with shaking boxes				Tests with drum filters	
Conc.	Feed % solids	Dewatered conc. tons/hr	Dewatered conc. % H_2O	Length of stroke mm	Dewatered conc. tons/hr	Dewatered conc. % H_2O
A 200	80.6	17.4	13.0	12		
A 200	42.0	16.4	14.9	12		
A 30	58.2	9.4	8.9	9	The filters could not be run because of too coarse pulps	
A 20*	71.2	5.2	10.2	6		
A 20*	67.7	5.5	12.2	12		
A 10	69.0	1.5	8.2	12		
A 10	56.9	1.1	8.9	12		
A 10	48.0	0.9	8.9	12		
A 9	72.8	2.0	11.8	6	10-12	7-8
A 9	48.9	1.4	10.2	6		

*Cum. weight : 35% +100 mesh. 66% +200 mesh. Spec. surface : 500 cm²/g

Table 3. Dewatering Tests With Magnetic Filter

Dimensions: 2000 x 850 mm
Effective filter area: 5.3 m²
Filter cloth: wool
Pulp tempelature: 12 deg C

Conc.	Feed % solids	Dewatered Conc. tons/hr	Dewatered Conc. H_2O %	Vacuum cm Hg	Approx. Cake Thickness mm	Speed of Drum rpm
A 200	76.4	68.2	8.1	1	—	2.8
A 200	62.2	63.5	9.3	1	—	2.8
A 200	—	67.8	7.8	1	—	2.8
A 30	71.2	40.0	9.0	13	25	2.8
A 30	67.0	41.8	10.2	6	23	2.4
A 30	68.8	34.8	9.2	8	27	2.1
A 30	56.7	36.8	9.9	8	28	2.1
A 30	59.0	40.1	7.9	20	15-25	2.8
A 9	63.3	26.8	11.0	28	15-18	2.8
A 9	66.1	29.7	9.4	44	15-18	2.8
A 7*	54.7	18.9	12.0	30	13	2.5
A 7*	54.0	20.0	11.6	25	12	2.8

*Cum. weight { 5% + 100 mesh / 30% + 200 mesh } Spec. surface 1100 cm²/g

Table 4. Dewatering Tests With Magnetic Filter

Dimensions: 2000 x 850 mm
Effective filter area: 5.3 m²
Filter cloth: wool
Feed: Magnetite concentrate

Spec. surface: Approx. 950 cm²/g
40-50% + 200 mesh
Fe = 70.3%
P = 0.059%
25 tons/hr

Feed Solids %	Dewatred concentrate Fe %	P %	H_2O %	Overflow lit/min	tons/hr	Solids Fe %	P %	Vacuum cm Hg
69.5			9.3	0				28
65.0	70.3	0.059	9.0	0				44
57.3	70.6	0.050	8.9	77	0.18	39.7	1.62	43
47.7	70.6	0.042	9.4	244	0.26	25.9	1.74	44
44.5	70.7	0.039	9.5	288	0.51	45.9	1.60	44

used to dewater about 20,000 tons of A9 concentrate.

It is the author's belief that the magnetic filter will also serve as a thickener of magnetic heavy media pulps.

Acknowledgment

The wholehearted support given the development of the magnetic filter by H. Gårde, general manager, T. Ekstam, manager, B. Hjortzber-Nordlund, chief engineer, and B. von Post, chief engineer, of the Luossavaara-Kiirunavaara Co. is herewith gratefully acknowledged. The author also wishes to express his thanks to K. Backman and A. Kortelainen, mill foreman and draftsman of the Luossavaara-Kiirunavarra Co., for their contributions to many valuable ideas at the experiments with the filter.

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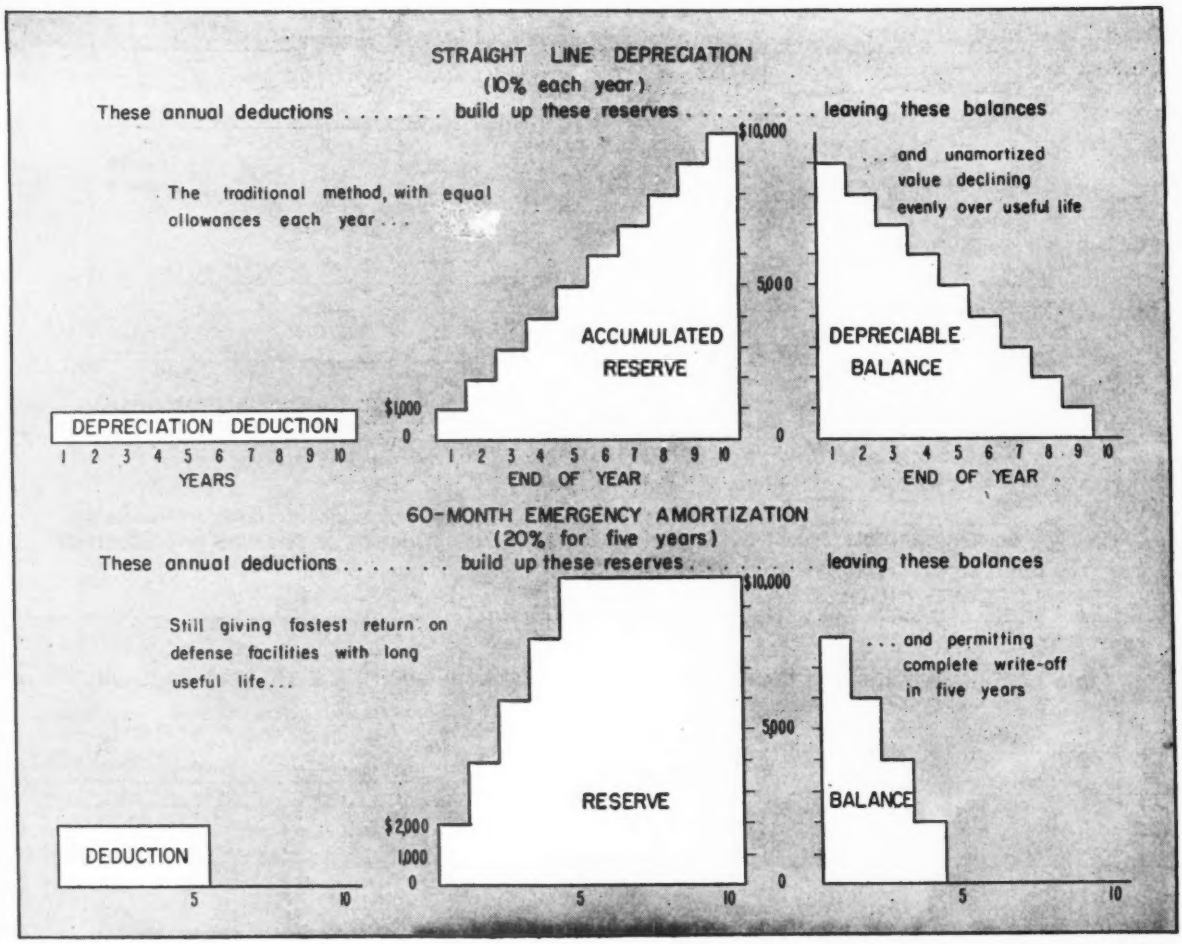
THE OLD Tax Law Gave These Ways To Figure Depreciation . . . . .


STRAIGHT LINE DEPRECIATION
(10% each year)
These annual deductions . . . . . build up these reserves . . . . . leaving these balances
The traditional method, with equal allowances each year . . .
. . . and unamortized value declining evenly over useful life
DEPRECIATION DEDUCTION
ACCUMULATED RESERVE
DEPRECIABLE BALANCE
$10,000
5,000
0
$1,000
0
1 2 3 4 5 6 7 8 9 10
YEARS
END OF YEAR
60-MONTH EMERGENCY AMORTIZATION
(20% for five years)
These annual deductions . . . . . build up these reserves . . . . . leaving these balances
Still giving fastest return on defense facilities with long useful life . . .
. . . and permitting complete write-off in five years
DEDUCTION
RESERVE
BALANCE
$2,000
1,000
0
5
10

Note: These charts assume an investment of $10,000

What You Need to Know

COULD YOU ANSWER THESE QUESTIONS?

1. In what seven ways may you now calculate the depreciation rate on new mining equipment?

2. Which of these methods is open to anyone and gives you the fastest, most easily calculated, write-off?

3. Which method would you use if you felt sure that before long income taxes would be lower than they are now, but that metal prices would hold their own?

4. Which method would you use if you felt that further inflation of taxes and prices was in prospect?

Read this brief survey for the answers.

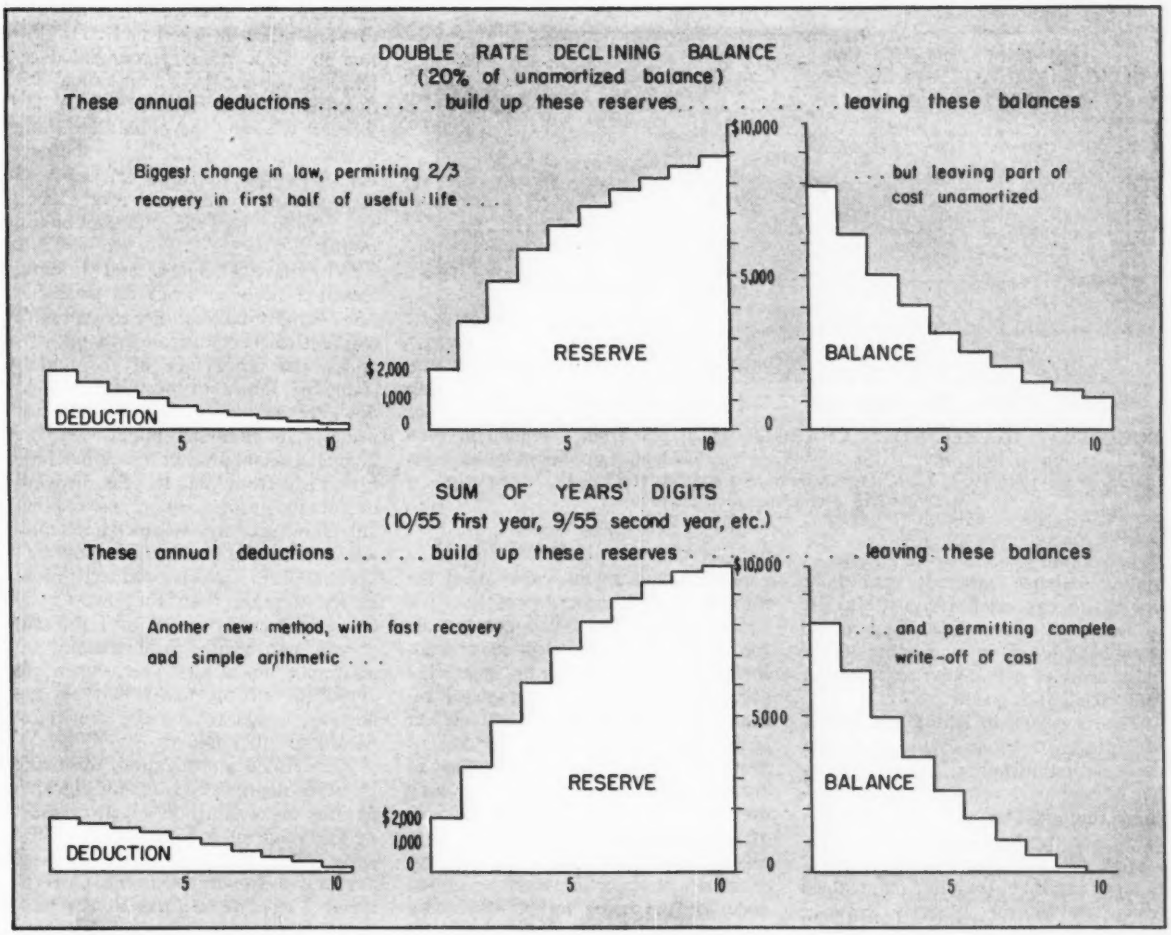
WILLIAM H. CHARTENER,
McGraw-Hill Department of Economics, New York, New York

YOUR COMPANY HAS MORE FREEDOM in the handling of depreciation under the new tax law than it has had in 20 years. Through its effect on corporate tax bills, profits, and money available for modernization and expansion, the depreciation allowance can now have a decisive impact on your company's operations in the months ahead.

That's why it would be well to know what new ways of handling depreciation are open to mining companies, and what each one has to offer. This article will summarize these facts.

Depreciation is already a big money

THE NEW Tax Law Gives You These Faster Options


DOUBLE RATE DECLINING BALANCE
(20% of unamortized balance)
These annual deductions . . . . . build up these reserves . . . . . leaving these balances
Biggest change in law, permitting 2/3 recovery in first half of useful life . . .
. . . but leaving part of cost unamortized
DEDUCTION
RESERVE
BALANCE
$2,000
1,000
0
5,000
$10,000
5
10
SUM OF YEARS' DIGITS
(10/55 first year, 9/55 second year, etc.)
These annual deductions . . . . . build up these reserves . . . . . leaving these balances
Another new method, with fast recovery and simple arithmetic . . .
. . . and permitting complete write-off of cost
DEDUCTION
RESERVE
BALANCE

in equipment having a useful life of 10 years.

Now About Depreciation

item for many businesses. Depreciation allowances last year came to nearly half the $24-billion that corporations spent on new plant and equipment, and the total annual amount charged to depreciation will probably increase by 50% over the next three years (see chart). These depreciation charges also represent a deduction from income for tax purposes, hence a saving, or at least a postponement, of tax payments.

You Have These Choices

These are the methods of handling depreciation now open to you under the new tax law:

1. Straight-line depreciation over the useful life of the asset, the standard method ordinarily required since the early 1930's. Equal amounts are charged off each year.

2. Double declining balance method, under which a fixed percentage, but smaller dollar amount, of the unamortized balance is charged off each year. The increase from 1½ to 2 times the straight-line rate permits write-off of two-thirds of an investment on the first half of its life. It is considered the most important change in the new law.

3. Combination of declining balance depreciation during early years of use of an asset, and straight-line for later years.

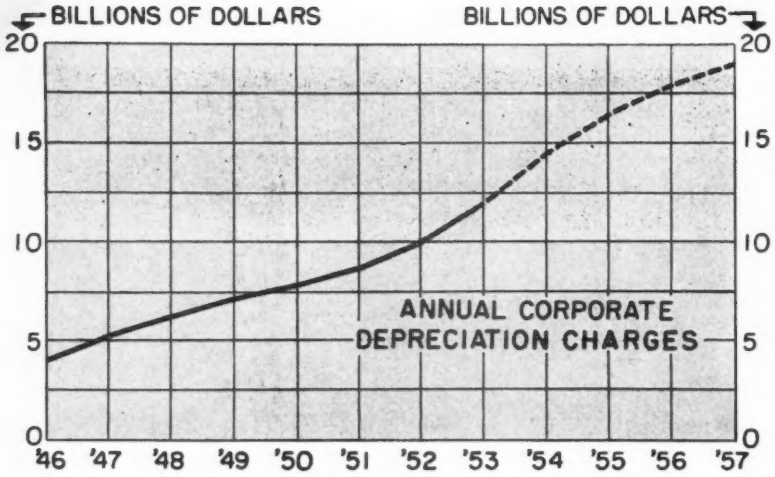
4. Sum of the years' digits methods, not much different from the double declining balance method, but easier to figure.

5. Any other formula that does not give an accumulated write-off greater at any point during the first two-thirds of useful life than would the double declining balance method.

6. Fast amortization, authorized during the Korean emergency on certified defense installations only, recovers cost of plant and equipment in 60 months. It's the fastest way for assets with a long life.

7. Unit of production method, also allowable under the old law, under which depreciation of equipment is apportioned over tons of ore, or barrels of oil, produced. It is largely limited to the extractive industries.

Note, however, that the liberalizing declining balance features of the new law may be applied only to new equipment installed, or buildings put in place, after Jan. 1, 1954. They cannot be used on machinery already in use or construction in place before that date. Also, the fast double de-



CORPORATE DEPRECIATION CHARGES, which rose from $4-billion in 1946 to $12-billion in 1953, may reach $19-billion by 1957 under provisions of new tax law. Source: 1946-1953, U. S. Department of Commerce; 1954-1957, estimated by McGraw-Hill Department of Economics

clining balance methods cannot be applied to any asset with a useful life of less than three years. That would permit write-off in one year of the entire cost of a two-year asset with a 50% straight-line rate.

The new law, in addition to allowing greater freedom in the choice of depreciation formulas, makes a number of technical and interpretive revisions that add up to an even better break for the businessman. A depreciation schedule agreed upon in writing, for instance, may not be changed arbitrarily by the Internal Revenue Service. It is specifically stated that the new declining balance provisions do not limit any methods available under the old law. A taxpayer, furthermore, is clearly given the right to use different depreciation methods for different properties.

The new provisions, by the way, are specifically declared available for depreciable mine improvements.

Why Is It Important?

What makes the treatment of depreciation in tax laws so important for business?

In computing net income for tax purposes the law permits, and has permitted since 1909, "a reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence): 1. of property used in the trade or business; 2. of property held for the production of income." The amount a business charges to depreciation is a deduction from its taxable income, which in turn, reduces its tax bill for the year in question. The manner in which depreciation is calculated over a period of years may also affect the total tax payments and profits.

Even without the inducement afforded by tax laws, depreciation allowances would have to enter the accounts of any well-managed business. To the accountant, depreciation is a device for assigning the cost of a machine or other capital asset to current production while it is being used and worn out, a systematic way of recovering the original cost of a capital item. Reckoning costs of production without making proper allowance for the using up of machinery and buildings is an excellent method of giving a business away.

Depreciation Affects Financing

Depreciation is also important in the finances of a business. Money set aside to recover the cost of an old piece of equipment may be used to replace it with new equipment. Ordinarily, depreciation allowances cannot be traced so precisely to another expenditure on an identical new machine to replace worn-out equipment. Rather, the annual depreciation allowance represents an addition to the funds a business has available for such purposes as modernization, expansion, debt reduction, outside investments, and even payment of dividends.

For a growing business, indeed, the depreciation allowance is almost never large enough to cover the year's replacement and expansion expenditures, and additional funds must be obtained from retained profits or new capital. Depreciation allowances, however, are a rapidly mounting source of funds.

It's Big Money

Depreciation allowances of corporations rose from $4.2-billion in 1946 to $7.9-billion in 1950 and $11.8-billion in 1953. With the combined effects of 60-month amortization for defense facilities initiated during the Korean War and the double declining balance method authorized in the new tax law, corporate funds derived from depreciation will probably reach $16.5-billion in 1955 and $19-billion in 1957.

Why have Congress and Internal Revenue been so strict on depreciation? Simply because it can represent a threat to the Government's tax revenues, the other face of the understandable desire of business to hold down or postpone tax payments. For instance, a company might vary the depreciation allowance on a machine arbitrarily from year to year, depending on its profit position. By making an allowance for depreciation only when there is a profit, the company's tax liabilities can be reduced more in those years than they would by equal allowances spread over the machine's entire life. And making no allowance in a loss year, when no corporate income tax would be due anyway, would reduce the loss as reported to stockholders.

Accelerated amortization, the name given a depreciation formula which permits the writing off of all or most of the value of a capital item in the early years of its useful life, likewise has drawn frowns from the Government. The extreme form of acceleration is *expensing*, which means that the entire cost is charged against income in the year of acquisition. By bunching all its investment in plant and equipment in years of high profit and expensing it, a company could diminish its income tax liabilities considerably. With the corporate tax rate now at 52%, the net cost of a machine could be considered as only 48% of its price. Other forms of acceleration, such as a declining balance formula, have a similar effect to a lesser degree.

The "tough" policy on depreciation, which is relaxed in the new law, dates back to 1934. Before that time, any rate selected by the taxpayer which was not regarded as clearly unreasonable was allowed to stand. Faced with falling tax revenues during the depression, Congress sought to increase corporate tax liabilities by tightening depreciation allowances.

The Treasury did most of the job administratively by requiring taxpayers to furnish detailed depreciation schedules, with a straight-line rate based on the full useful life of an asset.

In a manual which has become known as Bulletin F, the Treasury published tables listing average useful life of various buildings and pieces of equipment to serve as a guide in setting depreciation rates. This manual, last revised in 1942, has become the object of increasing criticism both for the length of useful life listed for various items and for the rigidity of its application.

The Korean emergency brought the first real easing in depreciation policy. In an effort to stimulate the rapid expansion of defense industries, Congress authorized the issuance of certificates permitting the complete write-off of facilities important to the defense build-up in five years, regardless of their estimated useful life. With fair certainty of Government orders to keep these facilities occupied profitably for several years and also the likelihood of continued high corporate tax rates, this fast amortization program proved a powerful stimulus. Certificates of necessity covering nearly $30-billion in defense production facilities have been issued in the four years since the beginning of the program.

The declining balance method of depreciation was available, incidentally, under the old law under certain circumstances. However, the limitation generally to 1½ times the normal straight-line rate served to reduce its attractiveness; and it has not been used to any great extent. Liberalization to the double rate, it is believed, will make the declining balance method vastly more popular, as the gain will be sufficient in many instances to offset the greater complexity in bookkeeping.

How Do They Work?

How do the various methods of depreciation work out in practice? Suppose you are buying flotation equipment costing $10,000 which has an estimated useful life of ten years. These are the basic ways you can figure depreciation under the new law:

1. Straight-line method. Find the annual rate by dividing 100% by the number of years of useful life (100% ÷ 10 = 10%). Take 10% of the original cost (10% × $10,000 = $1000). Make this allowance each year until the ten years are up. The allowance is the same each year, the unamortized value of the equipment decreases by the same amount each year, and the equipment is fully depreciated at the end of ten years.

2. Declining balance method. The new law permits a rate *on the declining balance* up to double the straight-line rate. In this case you would use 20%.

Take 20% of the unamortized value each year (first year, 20% × $10,000 = $2000; second year, 20% × $8000 = $1600; third year, 20% × $6400 = $1280, etc.). The annual allowance becomes smaller each year, the unamortized value decreases by progressively smaller amounts, and roughly 10% of the original cost is still unamortized at the end of the ten years. Note that about two-thirds of the original cost is written off in the first half of the useful life of the equipment.

3. Combination of declining balance and straight-line methods. To avert the problem of an unamortized residual (about 10%) at the end of the useful life which may exceed the salvage value of the equipment, the new law allows you to shift to the straight-line method at any time during the life of the equipment. This permits full write-off (less a realistic salvage value if you wish to deduct it from the value of the equipment), yet saves the advantage of faster early write-offs. In our example, you might want to switch to the straight-line after seven years under the declining balance. You would take one-third of the unamortized balance remaining at that time and charge off this amount in each of the last three years.

4. Sum-of-the-years'-digits method. Add the numbers representing the years of useful life (1 + 2 + 3 + . . . + 10 = 55). The sum is the denominator. The number of years of useful life remaining is the numerator. The fraction so obtained is applied to the original cost of the equipment each year (first year, 10/55 × $10,000 = $1818; second year, 9/55 × $10,000 = $1636; third year, 8/55 × $10,000 = $1455; etc.). The large allowances in the early years are close to those of the declining balance method, but the entire original value can be written off under the one formula during the period of useful life.

5. Emergency amortization. If a certificate of necessity under the defense program can be obtained, the equipment may be amortized fully over five years, regardless of the length of useful life. In this case, one-fifth of the original cost, or $2000, could be charged off each year. The entire cost would be written off in five years, and no additional depreciation could be taken subsequently. Note that the certificate need not cover the full amount of an installation, in which case only the certified portion is eligible for fast amortization.

6. Units-of-production method. This method is applicable primarily to extractive industries. Suppose you are installing $1-million worth of equipment on a mining property which is expected to yield 100,000,000 tons of ore. You will receive income as ore is mined and sold, and your operations and sales may not be the same each year. In this case, you might then charge depreciation at a rate of 1c for each ton of ore mined and sold, the entire cost being written off when 100,000,000 tons have been produced.

Which Is Best?

What are the advantages and disadvantages of fast depreciation compared with the standard straight-line method? How can you tell which method is best to use in any particular case? Several factors must be considered.

1. Recovery of investment. Any of the fast depreciation methods enables you to recover the cost of plant or equipment earlier than would the straight-line method. Under a double rate declining balance formula, you recover two-thirds of the original cost in the first half of the useful life (see charts). The sum-of-digits methods gives a slightly smaller figure than the declining balance in the first year or so, but the accumulated reserves soon pass those of the declining balance on a longer period of amortization.

For instance, in our example of $10,000 over ten years, almost ¾ of the original cost is recovered in the first five years. Fast recovery of investment speeds up availability of money for additional expenditures on plant and equipment, or just to gain interest on the money.

2. Accord with actual loss of value. Advocates of accelerated depreciation argue that most machines lose value faster during the early years of their life than during later years, mostly through faster obsolescence and more intensive use. George Terborgh, in a recent book *Realistic Depreciation Policy* published by the Machinery and Allied Products Institute, cites evidence of loss of resale value of roughly two-thirds in the first half of average life for a wide variety of equipment. (Buildings, with different characteristics from equipment, he found, did not lose resale value quite as fast.) The depreciation allowance, it is argued, should reflect the loss of value of a capital item; and the double declining balance formula seems to do this better than the straight-line method.

3. Effect on taxes. This depends on how your profits, and how tax rates, change over the period of depreciation. If the corporate tax rate remains the same and if you make a profit (after charges for depreciation) each year, then the *total* tax bill will be exactly the same no matter how depreciation

is figured. You may feel better, however, if you can put off paying taxes as long as possible. Accelerated depreciation, by cutting down taxable income in early years, postpones the years of heavy tax payments.

If you expect tax rates to *fall* in the next few years, then it will be to your advantage (assuming you are right) to hold off your heavy tax liabilities until you have the benefit of the lower rate. The more you can cut down taxable income in high-rate years, the less your total tax bill will be, even though you are paying taxes on the same total income over the entire period.

If tax rates *rise* instead of fall, then an accelerated depreciation formula will stick you with a higher total tax bill than a straight-line formula. You will have used up the bulk of your depreciation deductions in low-rate years. No matter how you apportion your depreciation allowances, you can use the total only once.

If you fear you will make money only during the early years of the depreciation period, you may gain a tax advantage from an accelerated formula. Your tax liabilities are reduced in profitable years by the higher depreciation allowance; and, in years of no profit, a deduction for tax purposes does you no good anyway. So you will not have to make up in higher tax payments later what you gain from taking heavier deductions in the profitable years.

If your bad years happen to be, say, the second and third rather than the eighth and ninth of a ten-year period, then the situation is reversed. The large early-year deductions of the accelerated formula will be wasted.

Another way fast depreciation can save taxes is through the favorable rate on capital gains. Suppose you sell equipment after a few years, long before its "useful life" has expired. You may be able to sell it for more than its unamortized value, especially if you have been writing it off at a double declining balance rate. Your profit over unamortized value in the sale is taxable as a capital gain, at only 25%; but the amount you have saved through fast depreciation allowances was at the income tax rate of 52%.

To illustrate: You sell your $10,000 worth of equipment after two years for $8000. Under declining-balance depreciation you have written off $3600, reducing your income tax liability by $1872, and giving the equipment a value on your books of $6400. On the $1600 gain your tax liability is $400. Subtracting this from your income tax saving, the *net* tax saving is $1472. Under straight-line depreciation, the deductions of $2000 would have reduced income tax liability by only $1040. This would also be the net tax saving, as the figures given would yield no capital gain.

4. Effect on financial statement. An accelerated depreciation formula tends to reduce the income you report during the early years, with corresponding increases in later years. Depreciation charges on a really large investment can swing a lot of weight in your income statement. Heavy allowances in the first two or three years may knock a big chunk out of reported profits. The effect in later years, however, would be to improve the profit showing. If you expect poor years later on, fast depreciation will prevent making these charges a continual drag. A straight-line formula, with equal allowances each year, makes the effect of depreciation on earnings the same in the early and later years.

5. Effect on bookkeeping. A straight-line formula is far easier to use from an accounting standpoint than a declining balance or sum-of-digits method. So, unless a good deal of money is involved, it will probably not pay you to become involved in fancy mathematics. The advantage of the declining balance method also drops when a capital item has a really long useful life.

On a building depreciated over 33 years, for instance, a double rate would mean only 6% in the first year compared with a 3% straight-line rate, and the difference would soon be insignificant. Fast depreciation is of advantage primarily to companies using a large investment in plant and equipment relative to labor and materials.

6. Effect on volume of capital spending. By holding out the attractions of faster recovery of investment and postponement, if not permanent savings on taxes, the new depreciation policy provides an incentive to spend more on new buildings and equipment. This would mean larger and more efficient capital plant for industry in general and more orders for construction and machinery industries. All of which points toward greater business activity in the immediate future and a more productive economy.

For the individual company, however, there is the possibility fast depreciation will offer temptations to make investments that might not be regarded as wise under a straight-line policy. The merits of the investment itself are still the most important consideration.

AMC Speakers Discuss Taxes at San Francisco

THE FEDERAL INCOME TAX personal exemption will be increased by at least $100 "as soon as the economy permits", Representative Hale Boggs of Louisiana, predicted at the American Mining Congress Meeting in San Francisco, Sept. 22.

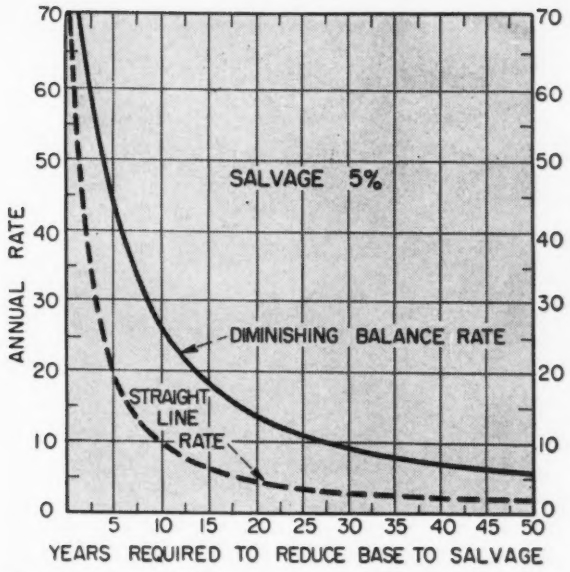
The current personal exemption is $600. Boggs, who is a member of the tax-writing House Ways and Means Committee, said he had attempted to include a $110 increase in the Internal Revenue Code of 1954, enacted earlier this year.

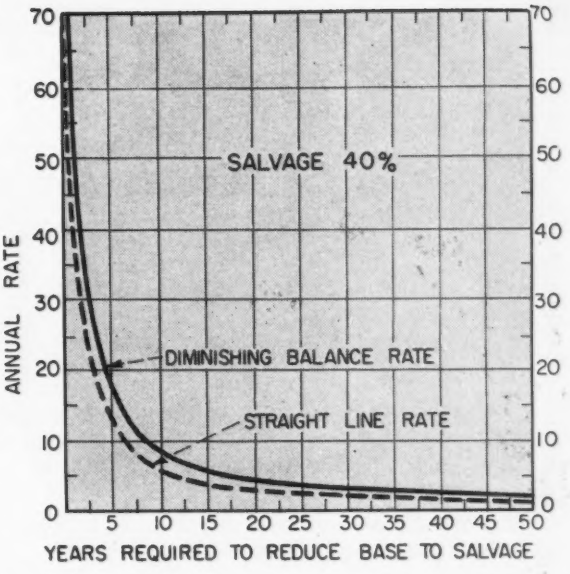
"I don't believe that we will ever see a Federal sales tax" he told the meeting, "principally because the States have pre-empted this field of taxation. Moreover, the idea that such a tax is a great revenue producer is fallacious."

Boggs said he felt that taxing of capital gains is a "regressive form of taxation" and prevents the full development of business in that "it penalizes funds which would otherwise be used for venture capital and investment." He said that during the past session of Congress, he had sought to reduce capital gains tax and to reduce the holding period for capital gains. Although this attempt was defeated, he predicted that "as Congress begins to understand the significance of this type of taxation, we will eventually receive a reduction in the tax as well as the holding period."

Boggs reminded his listeners that "Mining is a precarious undertaking," pointing out that heavy risks and the investment of large sums of capital are involved with no guarantee of fair return. "The entire industry would be adversely affected by a reduction in percentage depletion for mining," he said, predicting that efforts to lower percentage depletion rates would not succeed. "For my own part," he declared, "I will continue to oppose attempts to lower depletion rates."

Senator Wallace F. Bennett, of Utah, told the same audience during a discussion of the new Internal Revenue Code of 1954 that some of the new provisions affecting the mining industry were beneficial, but that Congress was not able to do all of the things that the industry had requested. He concluded that the worthwhile changes which had been made showed that Congress recognized the many risks involved in mining.





IF SALVAGE VALUE of new equipment is 5% (above left), or 40% (above right), of cost, these charts show what annual depreciation rates have to be in order to reduce cost to salvage value in any given period up to 50 yr.

How To Compare Old And New Depreciation Rate Formulas

PATRICIA BUTLER
GRANVILLE S. BORDEN
Standard Oil Co. of California
San Francisco, Calif.

In order to compare the rates and periods of time required to reduce capital recoverable through depreciation to its salvage value by the diminishing balance and the straight line methods of depreciation, we must first state both methods in terms of comparable equations. Assume that A represents the original value of the investment, that A^1 represents the salvage value, that n represents the number of periods, such as years or months, required to reduce A to A^1, and that r represents the constant percentage rate required to reduce A to A^1.

1. By the diminishing balance method, if A is the value of the original investment, then the value at the end of the first period will be $A(1 - r)$, and at the end of n periods, will be $A(1 - r)^n$. The value of A after the first year of depreciation is the original value less the depreciation for that year, $A - Ar$, or $A(1 - r)$. At the end of the second year, the value of A is the value at the end of the first year, $A(1 - r)$, less the depreciation on the diminished balance for the second year, $A(1 - r)r$:

$$A(1 - r) - A(1 - r)r =$$
$$A(1 - r)(1 - r) = A(1 - r)^2$$

Thus, at the end of n periods, the value of A will be $A(1 - r)^n$, which represents the salvage value A^1. In the form of an equation, this will be:

$$A(1 - r)^n = A^1$$

Dividing both sides of the equation by A, we have:

$$(1 - r)^n = \frac{A^1}{A}$$

By taking the n^{th} root of both sides we have:

$$1 - r = \sqrt[n]{\frac{A^1}{A}}$$

Solving for r, we arrive at the following equation:

$$r = 1 - \sqrt[n]{\frac{A^1}{A}}$$

For example, if the salvage value (A^1) is 5%, the original value of the investment (A) is taken as \$1, and we wish to depreciate the asset in 10 years, we find by substituting these amounts in the equation:

$$r = 1 - \sqrt[10]{.05\frac{1}{1}}$$
$$= 1 - \frac{\log (.05\frac{1}{1})}{10}$$

$$\frac{\log .05\frac{1}{1}}{10} = \frac{8.698970-10}{10} =$$

$$\frac{98.698970-100}{10} = 9.869897-10$$

$$\sqrt[10]{.05\frac{1}{1}} = .7411$$

$$r = 1 - .7411 = .2589 \text{ or } 25.9\%$$

2. By using the straight line method, the rate of depreciation required to reduce the asset to salvage value in a given length of time, we have only to divide the net depreciable sum by the number of years over which it is to be depreciated. Using the same terms as in the equation above:

$$r = \frac{A - A^1}{n}$$

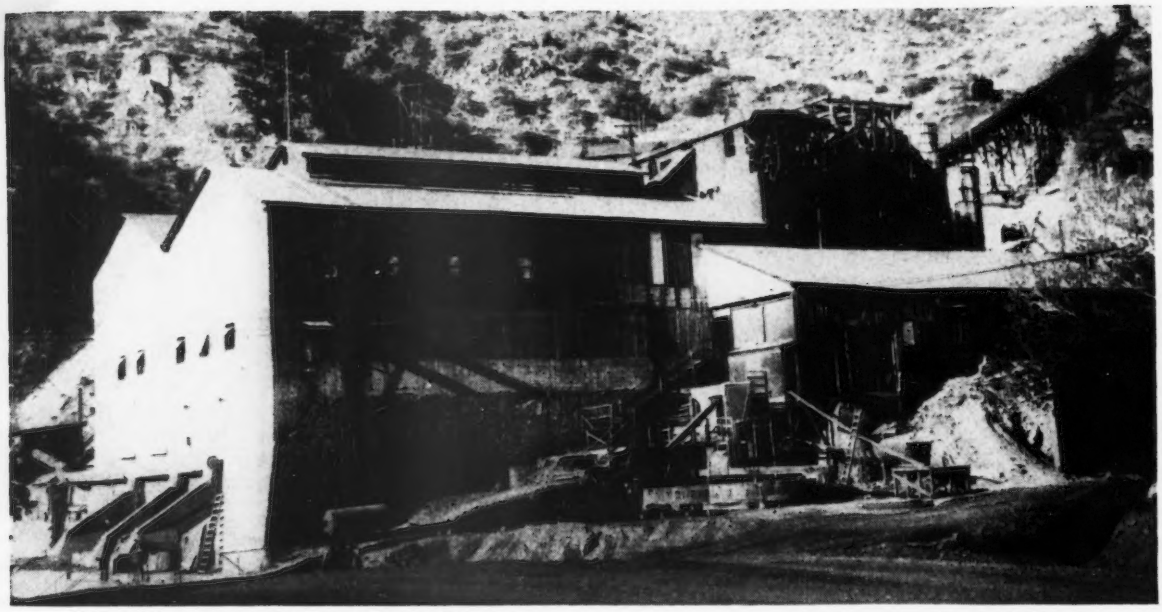
Substituting the same figures as in the previous example we have:

$$r = \frac{1 - .05}{10} = \frac{.95}{10} = .095 \text{ or } 9.5\%$$

Thus, we must use a rate of 9.5% per year to depreciate an asset to

(Continued on p. 100)

In addition to the charts show above, Miss Butler and Mr. Borden have prepared charts showing rates and periods for salvage values of 10, 15, 20, 25, 30, 35, 45, and 50%. They will be sent to any interested reader on request to The Editor, Engineering and Mining Journal, *330 West 42nd St., New York 36.*



FOUR 5X56-Ft. GOULD ROTARY FURNACES treat quicksilver ore at New Idria's surface plant in California.

New Idria Increases Production

JOHN B. HUTTL
Associate Editor

THE IDRIA MINE, where the bulk of mining is currently carried on, is opened by three main levels, known as Nos. 3, 5, and 10, all connected by supply, man, and ore transfer raises at strategic points. All workings above the No. 3 level and all evidence of the original outcrops were removed by previous open pit operations. The 8x6-ft No. 10 is the main haulage level, runs southwesterly for 3080 ft. All sections passing through heavy ground are timbered with 8x8-in. sets and lagging. The portal is at an elevation of 2714 ft and a short distance from the crushing plant ahead and above the furnace plant proper. Up to 1951 most of the ore has been found southeast of the point where the tunnel strikes a large overthrust fault.

The geology of the New Idria mines is described by Eckel and Myers in Vol. 2, No. 2 of *California Journal of Mines and Geology*. The mines lie in a faulted and distorted zone of Franciscan sandstones and shales. To the south is a large intruded mass of serpentine which contacts the Franciscan strata about a mile south of the Idria mine camp, and to the north is a series of Cretaceous and Eocene sediments consisting of Panoche sandstones and clay shales, Moreno shales and concretionary sandstones, Cantua shales and sandstones, Tejon beds and other formations. These beds all dip 30 to 60 deg N and strike about N 70 deg W.

The lowest, or Panoche formation appears to make a fault contact with the Franciscan strata at a point about 1000 ft above the portal of No. 10 tunnel. The Franciscan strata consists of massive beds of greenish brown sandstone interbedded with a layer of flinty black slate and a layer of highly contorted black shale. The structure of the mineralized area is very complicated because of the degree of contortion found in the Franciscan strata. The most prominent fault structure in the area is known as the New Idria thrust fault.

The quicksilver deposits in the New Idria lie in hydrothermally indurated beds of the Panoche formation beneath the New Idria thrust fault and associated tear faults offsetting the thrust. Both rock alteration and ore deposition were localized primarily at abrupt changes in strike of the fault plane, though changes in dip were also locally important in controlling some of the oreshoots and deposits. These consist of veins, veinlets, films, grains, and irregular lenses of cinnabar that fill fractures and interstices in indurated and strongly fractured shale. Unless there is abundant cinnabar, one may have difficulty in distinguishing ore from waste.

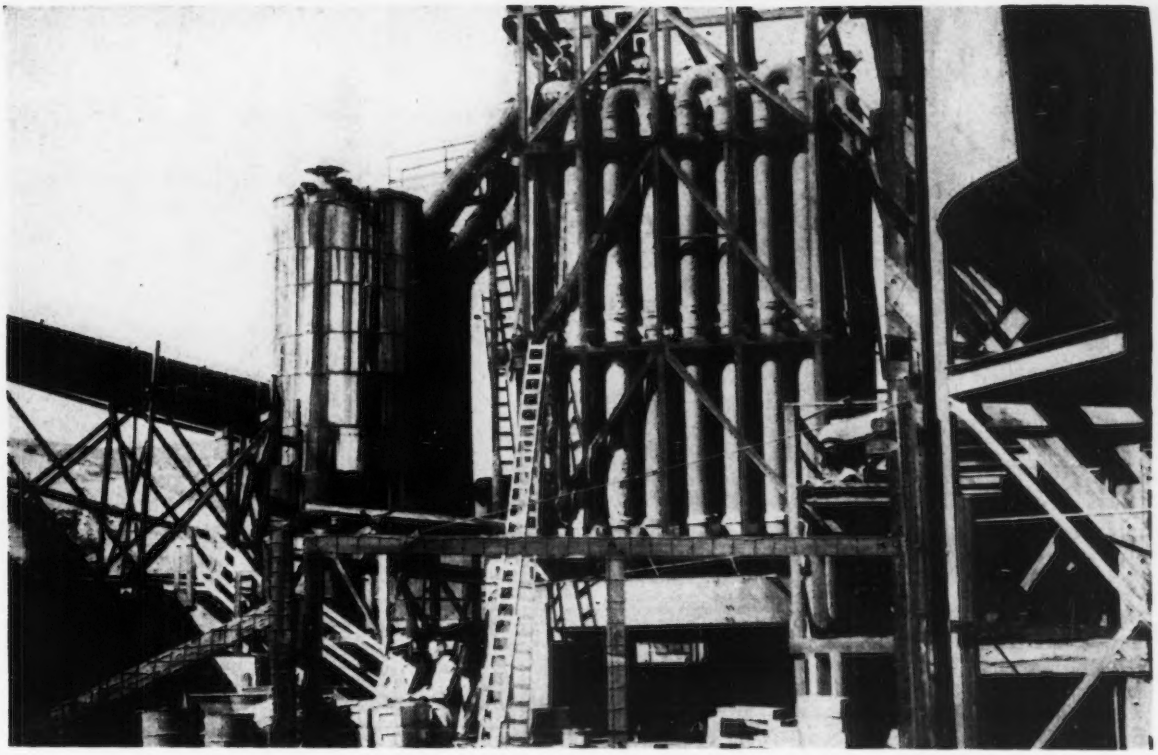
New Idria's Record

Even though the New Idria mine in San Benito County, Calif., is more than 100 years old, and has produced thousands of flasks of quicksilver during two world wars, new orebodies have recently been discovered, and mine and treatment plant output are being stepped up in response to present demands.

The mine has shown remarkable vitality since its discovery by Mexicans in the early 1850's, and has been in continuous production since then except for shutdowns in 1921-23 and 1950.

Estimated production from 1858 to Apr. 1, 1954 totals 475,500 flasks—a record surpassed only by the Almaden mine in Spain; the Idria, its namesake in Yugoslavia; the Huancavelica in Peru; and the New Almaden in California. Greatest output was achieved during World War II (1942-1944).

New Idria is one of the deepest quicksilver mines in the world. Its furnace capacity is second largest in the world. It was here that the late Henry Gould first proved the adaptability of the rotary furnace to quicksilver ore reduction.



QUICKSILVER-LADEN GASES from rotary furnaces are condensed in this 68-column vertical condenser.

Ore has been mined through a vertical range of more than 1400 ft and a horizontal distance of 1000 ft. Most of the orebodies found so far have been large and irregular in outline. For instance, one of the largest and richest oreshoots mined was a pipe-like body 800 ft high, 300 ft long, and 25 to 150 ft wide. It occupied a steep inverted trough at the intersection of the New Idria thrust fault with the "west of 9" tear fault. The orebodies discovered during the early part of World War II on the 4, 5, and 6 levels in the apex of the indurated body in the southeast block of the "5 east" fault zone furnished (from 1942 to the shutdown in 1950) some 292,898 tons of ore with a quicksilver content of 16.9 lb/t from which the furnace plant extracted 65,174 flasks of metal and 50,176 tons averaging 8 lb/t and 5213 flasks (from start of operations in 1951 to March 1954) or a total of 343,074 tons averaging 16.4 lb/t and 70,387 flasks.

When quicksilver prices began to fall in 1946, mining operations were curtailed gradually, but when no price improvement occurred the company shut down the mine in June 1950. A large part of the mine equipment was removed and the furnace plant maintained on a stand-by basis. Outbreak of the Korean War and increased government demand for quicksilver induced the company to reopen the mine in March 1951. All work centered in rehabilitating the No. 10 haulage level and constructing a condensing system of new design at the furnace plant. The first ore was burned on July 1, the ore being supplied from mine areas previously productive.

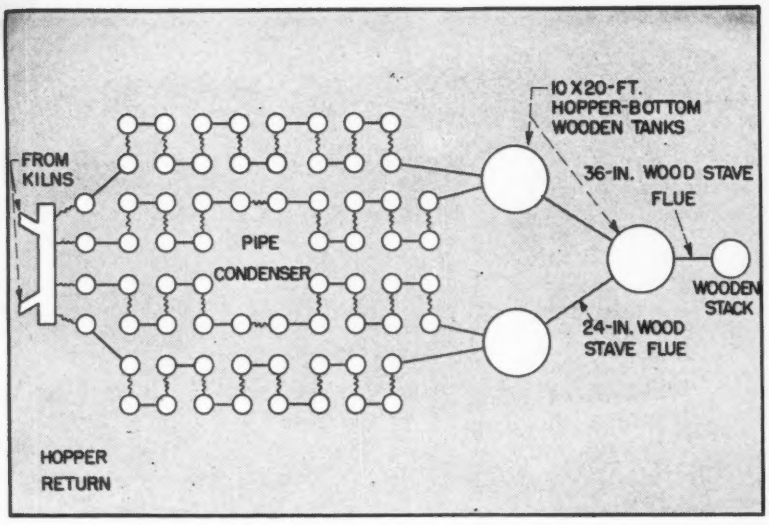
In August 1952, the company obtained a DMEA loan of $243,349, the Government portion being $182,511, to carry out 2000 ft of drifting, on the No. 10 level, 2000 ft on the No. 5 level, 1000 ft of prospect raises, and 600 ft of sublevel drifting to develop the West Idria area. About $56,380 of the loan was spent in new mine equipment. Work done in the southeast part of the mine on the No. 10 level resulted in opening up two small orebodies above this level. In November 1952, a winze was sunk on one of the oreshoots, and a level established on the 1050-ft horizon.

Up to March 1954 this area has produced 314 flasks from 3583 tons of ore averaging 7 lb/t. Work in the West Idria area led to the discovery of the 10L carbonte orebody. Ore production from this development, from March 1953 to March 1954, amounted to 14,967 tons averaging 13.1 lb/t, from which the furnace plant extracted some 2445 flasks. Royalties paid at 5% interest by the company to the Government during this period amounted to $18,582.88. The orebody lies in an entirely new zone, followed thus far for 1000 ft, that did not surface. Development in the zone continues with promising results.

In view of the present loan's not making it possible to carry current work into the West Idria area, the company has applied for an additional loan of $176,500 to run over a period of 2 yr.

In addition to the mine production from the 5 east, 1050-ft level, and 10L carbonate orebody, some 3640 tons of low-grade ore (2.9 lb/t) has been mined and beneficiated since reopening of the property in 1951 to March 1954 yielding 132 flasks from an open pit near the No. 3 tunnel portal; 5364 tons (7 lb/t) yielding 468 flasks from the 10L east area; and 1332 tons of 8.3 lb/t ore yielding 139 flasks from the 9L area.

Ore is mined by the conventional square-set system of mining, the individual sets used measuring 5x5x7½ ft. Because of the crushed condition of the ground, only a few sets along the strike of the veins and a few sets at right angle are opened at one time. These are filled with waste before adjacent ground is opened. Save for placing timber, all underground operations are mechanized. Both Joy mechanical loaders and locally-made scrapers are used for loading and transporting broken ore. Drilling is done with I-R drifters and stopers, using respectively 1⅛-in. lugged and 1-in.



PLAN OF CONDENSER shows position of 68 vertical 24-ft pipes. Dust chutes at bottom of condenser pipes discharge into tray shown at right.

C. HYDE LEWIS, general manager, points out hinged blades on hoes.

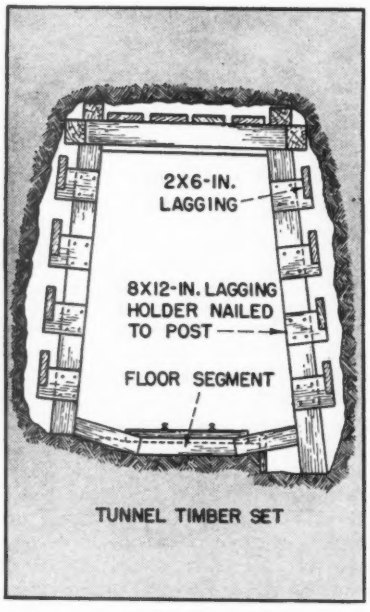
hexagonal steel fitted with Joy bits of the throw-away type. The scraper assemblies operated in flat stopes are operated by small Joy double-drum slusher hoists. Haulage equipment on the No. 10 and No. 5 levels consists of 5-ton Greensburg battery locomotives and 3- and 1½-ton rocker-dump mine cars. The smaller cars are used in development, headings only which in general are driven 8x6 ft in cross-section. Timber maintenance costs have been cut by adoption of segment timber set and flexible lagging.

As methane and hydrogen sulphide gas are present in the mine, ventilation is important. A large blower is installed at the portal of No. 10 tunnel and an exhaust fan at the No. 3 level. The air stream is routed through all main and sublevel tunnels and most of the stopes. Drift headings out of the air stream are ventilated by portable electric fans blowing into 16-in. steel and rubber ventilation pipe.

Ore stored in the different pockets on the No. 10 level is hauled in trains to the crushing plant a short distance from the portal over a 24-in. track system made up of 40-lb rails. Here, it is crushed to 2-in. furnace feed by a 15x28-in. Pacific jaw crusher and subsequently belt-conveyed to the elevated wooden storage bins at the furnace plant. Periodic samples are taken at the crusher.

Furnace Plant

The furnace plant currently in operation is one of the most modern known. Improvements made recently by C. Hyde Lewis on the furnaces and condenser proper to increase efficiency and cut costs are of considerable interest. The furnace equipment com-

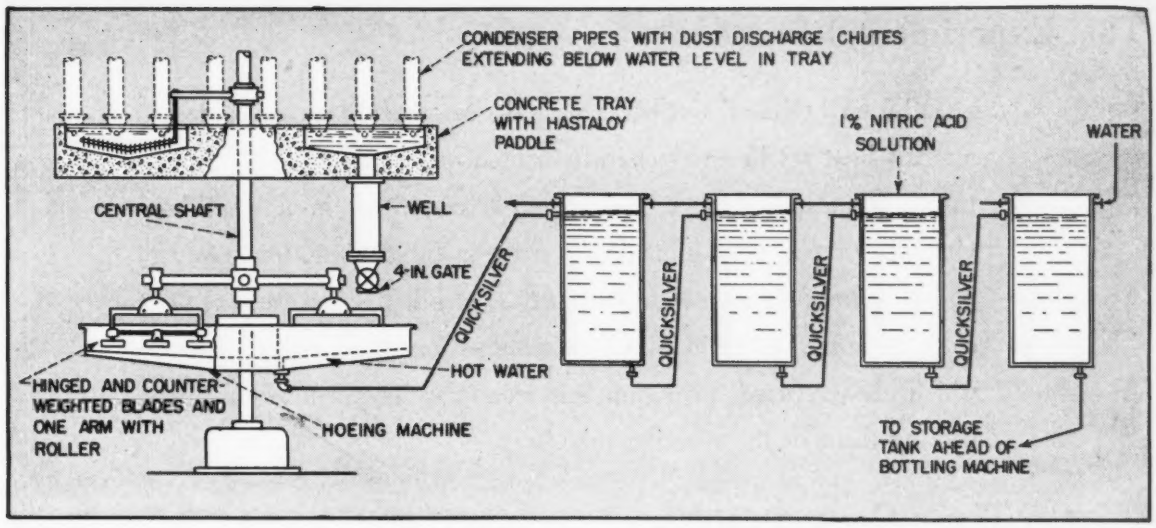


FLOOR SEGMENT in tunnel sets prevents timber from buckling under pressure.

prises four 5x56-ft rotary kilns set on a grade of about ½ in. per ft and turning at one revolution in 42 sec. Each kiln has a maximum capacity of about 125 tons a day. They are lined with cupola-type bricks laid on 1-in. abestos sheeting. The bricks are placed skin to skin without mortar and subsequently tightened by tamping the asbestos sheeting. After a kiln has been lined in this manner the brick surface is finished by pouring a slurry of Lumnite and water into the kiln pipe feeder and operating the kiln at slow speed for a time.

A sloping burned ore storage bin at the firing end of each kiln is of concrete construction, divided into a lower and upper chamber by a heavy steel plate. The upper chamber serves as a preheater for air used in kiln operations. Air enters a circular opening with a slide cover to adjust volume in the kiln floor above the burned ore bin, passes over the hot steel plate, acquiring in the process a temperature of about 400 deg F, and then goes into the wind box in front of the firing hood. From here the hot air enters the kiln via a Venturi-like muffle block some 24 in. long and 14 in. in dia at each end and 12 in. diameter in the center.

The burner is set back from the muffle block about 12 in. Around the periphery of the burner are 12 holes drilled at an angle so that the flame cone has an included angle of 30 deg. The flame cone passes close to and parallel to the upper part of the Venturi, and with all hot air from the burned ore bin going through it a perfect mixture of oil and air results. The burner used on each kiln is a No. 1 National Air-Oil burner, using compressed air at about 80 lb pressure to atomize the oil. To maintain regular and steady air pressure, an air regulator is installed in the air line near the burner. The 7 gravity fuel oil used is trucked to the plant from an Associated Oil pump station 50 mi distant. At the plant it is heated to 160 deg F by an electric heater before entering the kiln burners. Consumption per ton of ore treated averages 5 gal. The firing system installed has been found to give a perfect air-oil mixture without admitting an excess of air into the kiln which later has to be cooled in the condensing plant.



CONDENSED DUST goes through water-filled concrete tray to collecting well; then through hot-water jacketed hoeing machine. Quicksilver is piped to a battery of purification tanks, and finally to storage tanks ahead of bottling machine.

Several innovations have also been made on the charge ends of the kilns. For instance, the large dust chamber found in most furnace plants has been eliminated, and the quicksilver-laden gases generated in the kilns go directly through 12-in. square steel flues to 12-in. Sirocco dust collectors. The dust collected drops into a cone-shaped hopper below each Sirocco and is washed away by water rising through an 8-in. trap which is sufficient to seal the 5-in. vacuum in the Siroccos. From the Siroccos, the gases are drawn by a No. 30 American Blower Co. fan through 12-in. square steel flues to the manifold ahead of the condensing system proper. (See layout of the condenser and flow of gases through it.) It consists of 68 vertical pipes arranged in a square with room in the center to accommodate the drive mechanism actuating the paddle in the dust collector and mechanical hoe below, each pipe column being made up of two lengths (12 ft each) centrifugally-spun bell-and-spigot cast-iron pipe. Diameter of the pipe is 16 in. and thickness of wall ½ in. Pipe tops are connected with cast-iron returns containing opening for washing down interior of pipes, and the pipe bottoms with cast-iron hoppers fitted with 6x8-in. chutes extending into the circular dust collecting tray below filled with water.

The tray unit is of concrete construction, measures about 26 ft dia and 2 ft deep. A slow-moving paddle made from Hastaloy within the tray moves settled dust to a steel hopper or well with a 4-in. lever-operated valve installed near the midpoint of the radius of the tray bottom. Dust stored in this well is discharged into a mechanical hoeing machine. The tray and the pipe condenser assembly above it are supported by four massive concrete pillars. The hoeing machine is a steel pan, water jacketed and electrically heated, about 15 ft in dia with four sets of hinged blades and a roller on arms attached to a central shaft turning at about 1 rpm. This shaft, which also operates the tray paddle, is driven by a Wemco worm and gear and a reduction-geared 1-hp motor. Moving blades stir the drying dust mixed with lime on the sloping bottom of the water-heated pan, with freed quicksilver running toward the inner wall, whence a pipe opening drains it by gravity to the near-by purifying and bottling room. (See illustration of hoeing machine assemblies.)

Crushed ore from the storage bins is charged into the kilns through sealed 10-in. shaking feeders set on a grade of about 1½ in. per ft. The shaking motion is generated by a simple cam-and-spring arrangement, and feed volume can be adjusted by altering the speed of the cam. Temperature at the firing ends of the kilns is maintained at about 1200 deg F. The quicksilver-laden gases after treatment in the Siroccos pass at 450 deg F in four streams through the pipe condenser, two wooden tanks, a third wooden tank, all measuring 10 x 20 ft, before entering the 36-in. wood-stave side-hill flue connected to a short wooden stack.

In the bottling or clean-up room clean quicksilver is bottled by volume by a locally-designed bottling machine. Quicksilver produced during periods when spent mercury batteries are furnaced is cleaned by a unique process. During this operation most of the zinc burns in the kilns and leaves as zinc oxide. However, small quantities of zinc will pass into the pipe condenser, tending to amalgamate with the quicksilver. To clean it, the quicksilver is passed through four 12 x 24-in. stainless-steel tanks, in series, with a 1% nitric acid introduced at the top of tank 3 flowing counter current over the quicksilver surface in each tank.

The improvements made in the furnace and condenser plants and bottling room provide easier working conditions and reduce health hazards and facilitate operation of the entire reduction works with two men per shift in contrast to 20 or more per shift needed in the years before 1940, and 6 to 10 during the war. The two men also remove and truck burned ore to the dump.

Current monthly production averages 600 flasks. Total number of men employed is 110; 65 underground and 5 in the saw mill. Repair shops, warehouse, compressor house and change rooms are near No. 10 mine portal. At the camp site below, the company has provided modern housing facilities for married and single men, cafeteria, school, general store, hospital, recreation halls, and general office. TV is available to the residents through the antenna erected recently by the company on Mt. Idria.

Chas. F. Parker, Jr., is president of New Idria Mining and Chemical Co. Operations at the property are directed by C. Hyde Lewis, vice president and general manager, whose help in preparing this report is gratefully acknowledged. Wesley Shadduck is superintendent; Richard Peterson, engineer, and Austin Ventres, secretary-treasurer.

This Experimental Procedure . . .

DRY CHLORINE GAS was passed over the charge contained in a small boat set in an electrically-heated quartz tube. The temperature was measured by a thermocouple contained in a small-bore vitreosil protection tube inside the reaction tube. Time, temperature, and chlorine flow rate were carefully controlled. Pressure was kept close to atmospheric in all experiments. For those experiments in which air was used, provision was made for its purification before passing through the reaction tube.

. . . On These Concentrates . . .

	%Zn	%Fe	%Pb	%Mn	%S
American Smelting & Refining Co. (AS&R)	51.3	6.7	3.4		33.4
Consolidated Mining & Smelting Co. (CMS)	47.4	12.4	4.6		31.2
Franklinite	17.4	32.0		14.0	

. . . Reveal The Potentialities of . . .

Extracting Zinc From Concentrates By Chlorination

JOHN S. SIEGER COLIN G. FINK*

LABORATORY SCALE TESTS on chlorination of zinc concentrates at high temperatures (650-750 deg C) show that you can separate zinc and lead as volatile chlorides, leaving behind unchlorinated iron and/or manganese. In addition to substantiating the possibilities of selective chlorination, data was furnished by the tests for other relevant conclusions:

(1) By mixing air or oxygen with chlorine, sulfide concentrates can be treated to chlorinate zinc and lead completely and simultaneously to prevent chlorination of iron, by formation of iron oxide.

(2) In treating a sulfide concentrate with chlorine mixed with either air or oxygen, the minimum oxygen:chlorine ratio required to prevent chlorination of iron corresponds approximately to that required to permit formation of SO_2, Fe_2O_3, $ZnCl_2$, and $PbCl_2$.

(3) If a concentrate high in manganese is treated with chlorine mixed with air at 750 deg C, chlorination of both manganese and iron can be prevented while still permitting chlorination of zinc.

(4) The ratio of oxygen:chlorine required to prevent chlorination of manganese in franklinite with use of air corresponds closely to the theoretical required to reverse the reaction

$$MnO(s) + Cl_2(g) = MnCl_2(1) + \tfrac{1}{2}O_2(g).$$

First a study was made of the chlorination of a sulphide concentrate which had been given a preliminary roast at temperatures up to 800 deg C. Effects of time and temperature of chlorination were determined.

Effect of Time

Fig. 1 shows the effect of time of contact on the rate of chlorination of the constituents of the roasted concentrate. Practically total chlorination of the zinc and lead constituents occurs before chlorination of the iron oxide begins. Five minutes' chlorination, for example, removes about 99% of the zinc and lead and only 1% of the iron. Moreover, since the weight of the zinc in the original material is over seven times that of the iron, the absolute amount of iron chlorinated in relation to the zinc is a very small figure.

Absence of chlorination of iron during the first few minutes can perhaps be explained by considering ferric chloride as a chlorinating agent. If ferric chloride were formed from the oxide, it could be expected to act itself as a chlorinating agent for any unreacted zinc oxide:

$$3ZnO + 2FeCl_3 = Fe_2O_3 + 3ZnCl_2.$$

The equilibrium constant for this reaction is even more favorable than that for the direct chlorination of zinc oxide.

* This manuscript was originally completed shortly before the death of Prof. Fink late in 1953, and has since been rewritten by Mr. Sieger.

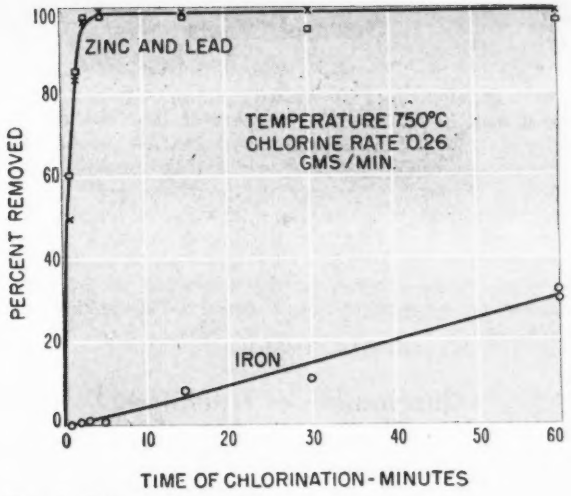


Fig. 1. Effect of time.

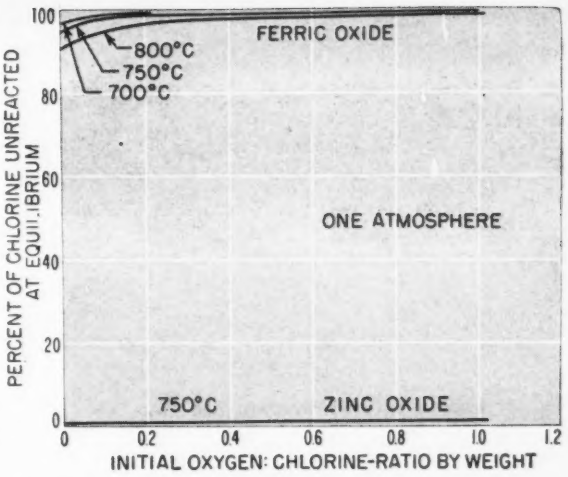


Fig. 3. Oxygen magnifies equilibria differences.

One important conclusion is evident: the difference in the overall rates of chlorination of zinc and lead oxides on the one hand and of ferric oxide on the other is such that in a mixture of the three in a roasted ore a practically quantitative chlorination of the first two can be achieved without chlorinating any measurable amount of the last.

Effect of Temperature

Temperature has a pronounced influence on the volatilization of zinc and lead chlorides from a roasted concentrate. Although the boiling point of zinc chloride is 732 deg C and that of lead chloride is 954 deg C, the vapor pressures are such that volatilization is complete even at temperatures well below the boiling points. The vapor pressure of zinc chloride begins to rise rapidly above 550-600 deg C and that of lead chloride above 650 deg C.

Curves given for volatilization are probably very nearly those for total chlorination. Chloride analyses on the leached products of chlorination of roasted concentrates and of pure zinc oxide at 600 deg C showed almost no soluble chloride present. Therefore the principal effect of increasing temperature is to increase the rate of reaction rather than to increase the rate of volatilization of zinc chloride.

Curves show that successful operation could probably be carried out at temperatures lower than 750 deg C. For example, at 650 deg C, recovery of zinc as volatile chloride is over 99% complete and the recovery of lead is 85% complete at 15 minutes' chlorination time. A good separation from iron is still possible, even with the longer time; only about 3% of the iron is chlorinated under these conditions. In practice a balance would have to be made between temperature and time, with allowance for the existence of small amounts of liquid zinc and lead chlorides at lower temperatures.

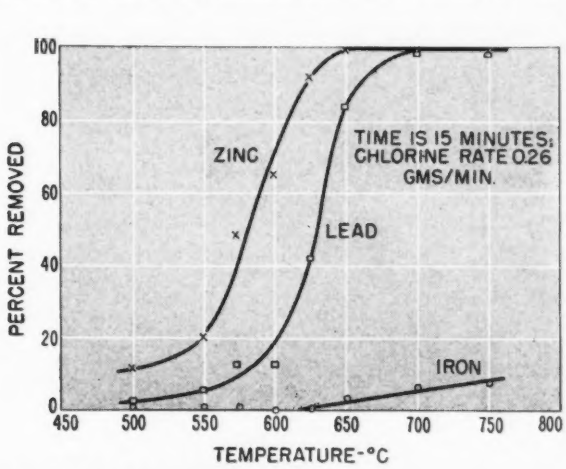


Fig. 2. Effect of temperature.

Oxygen Magnifies Equilibria Differences

From data available in the literature on heat capacity, free energy, and entropy, equilibrium constants for the chlorination of zinc and lead oxides were calculated. These results, together with the figure given by Galmiche for chlorination of ferric oxide, are as follows at 750 deg C:

Reaction	K
$PbO(s) + Cl_2(g) = PbCl_2(g) + \frac{1}{2}O_2(g)$	7×10^{-11}
$ZnO(s) + Cl_2(g) = ZnCl_2(g) + \frac{1}{2}O_2(g)$	67.5
$2Fe_2O_3(s) + 6Cl_2(g) = 4FeCl_3(g) + 3O_2(g)$	7×10^{-11}

Constants for lead and zinc are very high, and that for iron is quite low. The value for zinc is such that if a definite amount of chlorine is allowed to react with an excess of zinc oxide and the reaction products are not swept away, only about 0.9% of the chlorine will be unreacted at equilibrium. A similar figure for lead would, of course, be much smaller. For iron, on the other hand, only about 5.8% of the chlorine would react.

An even sharper equilibrium difference could be achieved by mixing air or oxygen with the chlorinating gas. The effect of oxygen in the initial gas on the percent of chlorine unreacted at equilibrium is shown in Fig. 3.

Mixed Oxidation-Chlorination

Experiments were carried out on the treatment of unroasted sulphide concentrates with a stream of chlorine containing various percentages of oxygen, added either as such or by use of measured quantities of air. The flow of chlorine was kept constant and oxygen content varied by changing the flow rate of air or of oxygen. The results are shown for two types of concentrates in Fig. 4 and 5.

Degree of chlorination of iron is very greatly dependent on the oxygen content of the gas. Zinc and lead are completely chlorinated at all ratios of oxygen:chlorine tested, but the reaction of iron can be varied from practically total chlorination to almost total oxidation. This seems to

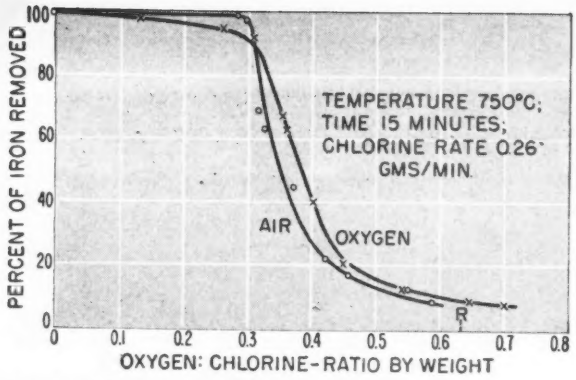


Fig. 4. Mixed oxidation-chlorination.

hold true whether the iron is originally present largely as FeS_2, as in the AS&R concentrate (Fig. 4), or as FeS, as in the CMS concentrate (Fig. 5).

Range of oxygen:chlorine ratios over which the change in the iron reaction takes place is rather narrow. It might be expected that the oxygen content required to prevent chlorination of iron would be approximately that sufficient to bring about complete oxidation of iron and sulphur while permitting chlorination of zinc and lead. This ratio is indicated as R on the graphs. As can be seen, the actual position of the sharp change in the curves is not far from this value. The difference seems to show that a small amount of free sulphur can be produced without hindering appreciably the oxidation of iron.

Fig. 4 shows that it makes little difference whether air or pure oxygen is used; the curves are almost identical with respect to oxygen content of the gas. The fact that the curve for air lies to the left of that for oxygen probably indicates that dilution of the gas with nitrogen decreases the rate of oxidation of iron sulphide less than it does the rate of chlorination. This effect, however, is quite small.

Possibly a mixed oxygen-chlorine or air-chlorine gas stream might be used in chlorination of other iron-containing sulphide ores. The metal to be recovered or removed must form a volatile chloride at a temperature, oxygen:chlorine ratio, and reaction time at which sulphides of iron are converted to oxides rather than to chlorides. As has been demonstrated above, zinc and lead meet these requirements.

Thermal Effects

Calculation of the heat effects in the various reactions shows chlorination of the roasted concentrate to be a somewhat endothermic reaction, because of heat required to vaporize zinc chloride. For the roasted AS&R concentrate, this amounts to 310 Btu/lb. However, if the unroasted concentrate is treated with a gas stream containing the proper oxygen:chlorine ratio to oxidize the iron and volatilize the zinc and lead as chlorides, the overall reaction is exothermic to the extent of 1660 Btu/lb. By partial preliminary roasting of the concentrate, the heat effect of the latter method of chlorinating these concentrates could be made zero.

Chlorination of Franklinite

In chlorinating a franklinite concentrate, zinc and iron chlorides are both vapors at 750 deg C, and the percentages removed, as indicated by the data, are equal to the total percentages of these constituents chlorinated. Manganese, however, forms a high-boiling liquid chloride, which remains behind in the residue.

Loss of chlorine to manganese chloride makes it doubtful that a straight chlorination process for an ore high in manganese could be considered even potentially useful. Investigation was therefore made to determine whether or not the chlorination of both iron and manganese could effectively be stopped. It was found that this result could be achieved by mixing a sufficient proportion of air with the chlorine.

Chloride Produced With and Without O_2

Two curves are shown in Fig. 7. The first shows the amount of soluble chloride produced by direct chlorination with gases containing various proportions of oxygen and chlorine. The second curve shows the soluble chloride after chlorinating the ore with undiluted chlorine and subsequently treating the product with a mixed air-chlorine stream. Consideration of both curves eliminate the question introduced by the fact that equilibrium is not attained either in chlorination of the oxide materials or in oxidation of the chlorinated residue. The actual curves are not very far apart.

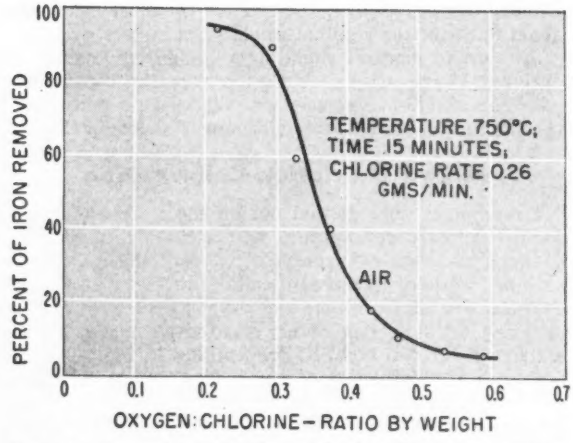


Fig. 5. Mixed oxidation-chlorination of concentrate from Consolidated Mining & Smelting Co.

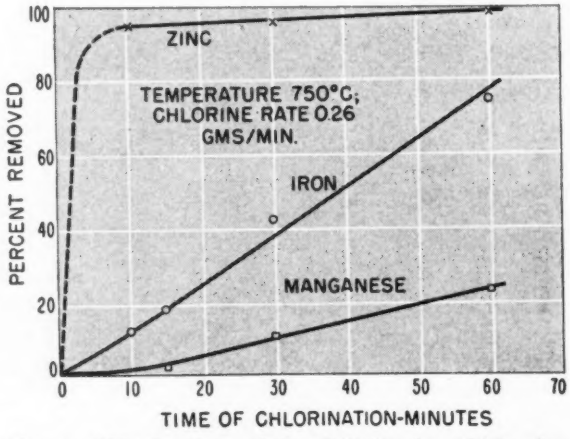


Fig. 6. Chlorination of Franklinite in which zinc and iron only are vaporized.

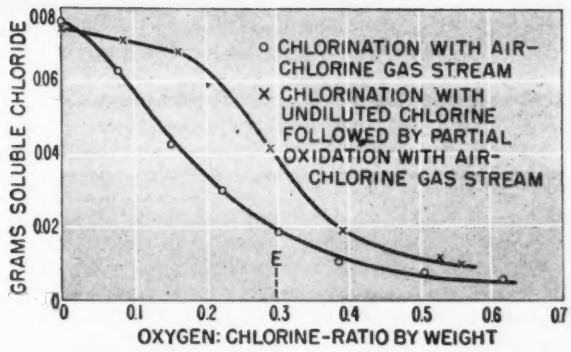


Fig. 7. Chloride produced with and without O_2.

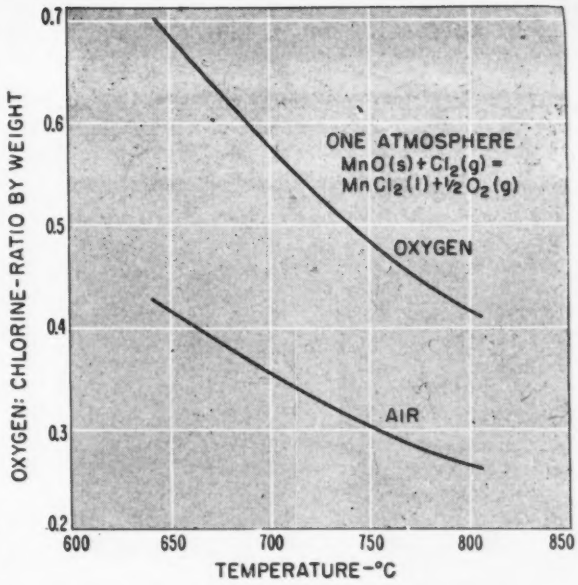


Fig. 8. O_2:Cl ratios to prevent chlorination.

O_2:Cl Ratios to Prevent Chlorination

Theoretically, if a single compound were present, there should exist a certain oxygen:chlorine ratio above which the partial pressure of oxygen would be sufficiently high to prevent any chlorination. From entropy, free energy, and heat capacity data, this ratio has been calculated for various temperatures for the reaction

$$MnO(s) + Cl_2(g) = MnCl_2(1) + \tfrac{1}{2}O_2(g).$$

Fig. 8 shows this relation for air and for oxygen. Under the experimental conditions, the value of oxygen:chlorine is 0.30. This value is indicated as E on Fig. 7.

Experimental results do not show the abrupt break predicted by the above calculation. The difference is probably caused in large part by the presence of substances other than MnO. Some Mn_2O_3 is present, and the oxides of zinc, iron, and manganese are probably chemically combined.

The general conclusion is evident, however, that the chlorination of manganese and iron can effectively be prevented by use of a mixed air-chlorine stream while permitting successful chlorination of zinc, and that the necessary oxygen:chlorine ratio corresponds approximately to the theoretical for the chlorination of manganese oxide. ●

How to Prevent Ethyl Mercaptan Explosions in Mine Warning Systems

Ethyl mercaptan is introduced in airlines at Cerro de Pasco's Morococha mine in Peru for periodic fire drills. On April 24, 1954, during such a stench warning test, an explosion occurred a few seconds after several bottles of mercaptan had been introduced into 6- and 10-in. pipelines leading to two sections of the mine. There were no fatalities, but the explosion ruptured about 200 ft of 6-in. pipeline, pipe fittings, and three air receivers.

Since this occurrence was unprecedented, Cerro de Pasco officials supplied the U. S. Bureau of Mines with full details, and asked them to investigate and solve the problem. The Bureau cooperated promptly by doing a considerable amount of research, and published a report[1] on August 11, 1954.

The Bureau's report is summarized in part as follows:

Ethyl mercaptan, C_2H_5SH, is a highly volatile and flammable liquid which presents fire and explosion hazards during use. Range of flammability extends from 2.8 to 18.2% by volume in air at atmospheric temperature and pressure.

Causes of the explosion at Cerro may have been one or more of the following: (1) Releasing the entire charge of mercaptan from glass bottles through a brass plunger into the pipeline at one time which might have created an explosive mixture. (2) Hot carbon particles from the compressors which might have ignited the mixture. (3) Bits of sawdust or paper injected with the mercaptan which might have ignited the mixture.

The Bureau suggested the following explosion preventive measures: (1) Cylinders and all equipment used to introduce mercaptan should be made of stainless steel. (2) Cylinders should be located as far away from the compressor as possible to allow cooling of compressed air. (3) Mercaptan should be fed into the line slowly enough to prevent explosion concentrations. (4) Inert Freon-12 or Freon-22 should be mixed with the mercaptan to produce nonflammable injections.

In forwarding the foregoing information to *E&MJ*, Mr. Robert Koenig, president of Cerro de Pasco Corp., and Frank Spencer, Jr., resident engineer, expressed their appreciation of the speedy and thorough job which the U. S. Bureau of Mines performed in investigating and preparing this vital safety information.

[1] Ethyl Mercaptan Vapor-Air Explosion at the Cerro de Pasco Corporation Mine, Morococha, Peru, April 24, 1954: Elimination of Such Explosions by the Use of Freons. By G. W. Jones, M. G. Zabetakis, and G. S. Scott. Report No. 5403, Project 2801-195, Aug. 11, 1954. U.S. Bureau of Mines, Explosives and Physical Sciences Division, Pittsburgh, Pa.

AFTER THREE YEARS OF EXPERIMENT using several thousand diamond bits in actual field tests, the author reports that his company was convinced that wholesale conversion to oriented diamond bits (shown above) was warranted.

Experiments with Oriented Diamonds Indicate 42% Savings in Bit Costs

ADRIAN E. ROSS
President
Sprague & Henwood, Inc.

ONE OF THE CONTROVERSIAL SUBJECTS currently being discussed by those associated with the diamond bit business is whether or not the results obtained from the use of oriented[1] bits justifies the added cost of producing such bits. Some of the proponents tend to describe results obtained through the use of oriented bits in glowing terms while those opposed to orientation are equally inclined to ridicule the results and claim that no real, long range, benefits can be expected.

After three years of experimentation during which several thousand bits were tested under actual field conditions, the results obtained were such that we in Sprague & Henwood, Inc., were convinced that a wholesale conversion to the use of oriented bits was warranted. This wholesale conversion was initiated in September 1953 when we discontinued the manufacturing of random-set diamond bits containing diamonds larger than 40 per carat in size and started furnishing oriented bits to all customers at no increase in price. Since that time, through the experience gained and the application of a modified setting procedure, we have been able to orient still smaller diamonds.

Bureau of Mines Assists

Currently diamonds under 80 per carat in size are oriented in hard vector directions in the crowns of all surface-set bits which we manufacture. The rapidity with which these new setting techniques were devised and applied is due, in a large part, to the help and advice freely given to us by members of the U. S. Bureau of Mines, Mount Weather Station, Mining Research Staff.

In view of our complete conversion

[1] Throughout this article the term "oriented" is used to denote a diamond set in such a manner that a hard vector direction of the crystal is in opposition to the rock surface to be cut or drilled.

Cost and Performance Comparisons, Before and After Orientation

Job No.	Ft drilled		Diamond cost, dollars		Diamond costs, cents ft		No. of bits		Ft drilled per bit	
	Random	Oriented	Random	Oriented	Random	Oriented	Random	Oriented	Random	Oriented
1*.....	1561	560	2060.18	591.54	1.32	1.06	145	26	10.8	21.5
2*.....	428	968	627.65	717.50	1.47	0.74	49	47	8.8	20.6
3*.....	3943	5259	1036.58	1091.05	0.26	0.21	82	51	48.1	103.1
4**.....	333	554	599.40	520.76	1.80	0.94	15	18	22.2	30.8
Total.....	6265	7341	4323.81	2920.85	0.69	0.40	291	142	21.5	51.7

Note: Random bit figures based on January and February 1953 operations.
Oriented bit figures based on January and February 1954 operations.
*S&H contracts. **Bit customer's data.

to oriented diamond bits we have few test results which might be considered as a source of data for a current comparison of the differences between oriented and random-set bits. Consequently, we suggest that readers refer to an article on this same subject published in the August 1953 issue of the *Mining Congress Journal* for information which will supplement that contained in this article. The few comparative results recently obtained are summarized in the accompanying table. Information in this table was obtained from a bit customer and from several of our own contract jobs in which drilling was performed in the same rock formations and under similar conditions for over a year. The table is a summarized comparison of the bit cost figures for January and February 1953 (random-set bits), with those of January and February 1954 (oriented bits).

What the Data Indicates

The following conclusions are based on an evaluation of the data in the table:

(a) Cost per ft for diamonds in oriented bits is approximately 42% less than the same cost in random-set bits.

(b) Oriented bits gave more than double the footage of random-set bits per setting.

(c) Increased footage per setting obtained from oriented bits would indicate an additional indeterminable saving in setting charges per foot drilled. Thus the overall saving in bit cost should be somewhat larger than the 42% saving in diamond costs mentioned in (a).

(d) Use of oriented bits resulted in more "on bottom time" and thus effected an indeterminate saving in labor cost.

A comparison of the indicated savings as shown in Table 1, when oriented bits are used, with those reported in the August 1953 Mining Congress Journal shows that a somewhat larger saving has been effected in the more recently set bits. This may possibly be explained by the fact that the bit setters have acquired more skill in orienting the diamonds used. However, the difference may well be within the range of variation to be expected in any field test where drilling conditions cannot be as closely controlled as they could be in laboratory tests.

Orientation, admittedly, is not a cure-all. It is merely one more manufacturing procedure which, when mastered, contributes materially to the creation of an improved and more enduring product. We try to be conservative when speaking of the results obtained through the use of oriented bits, but when faced with the magnitude of the savings effected, as indicated in our tests, it is understandable why some of the proponents of orientation tend to be a bit over-enthusiastic. By the same token the skeptics can claim that such a phenomenal difference is an impossible achievement or a fluke result which one may or may not be able to duplicate. Therefore, in this interim report, an effort has been made to list only facts and to omit explanations as to why these savings were experienced except to point out some of the factors which greatly influence the ultimate bit cost per foot drilled. Some of these major bit cost factors are listed as follows:

DIAMOND DRILL RIG using oriented bits in the uranium fields of eastern Utah, where one of the world's largest exploratory drilling campaigns is under way by both Government and private industry.

Major Bit Cost Factors

(a) Grade of Diamonds. It is well known that there is a proper grade of diamond for each formation. High priced diamonds are unnecessary and costly when used in soft coal formations, for example. Likewise, low grade diamonds are costly and ineffective when used in hard formations, such as the taconites of the Mesabi Range.

(b) Size of Diamond. Small diamonds of usually a high grade are essential for economical operation in hard consolidated formations. Large diamonds are essential for economic drilling in soft formations, such as the sandstones of the Colorado Plateau.

(c) Bit Pattern. Diamonds must be arranged so that an adequate coverage is obtained. Otherwise serious diamond losses will result.

(d) Waterways. Bits with more than two waterways are considered to be poorly designed if used in some of the taconite formations. Bits with less than eight waterways are not acceptable in the carnotites and sandstones of the Colorado Plateau.

(e) Diamond Exposure. In certain hard, broken rocks, minimum exposure of diamonds is essential, whereas in certain easy drilling shales maximum exposure of diamonds is preferred.

(f) Structural Resistance. Even oriented diamonds must be set so that the diamond structure itself is protected from excessive shear and fracture.

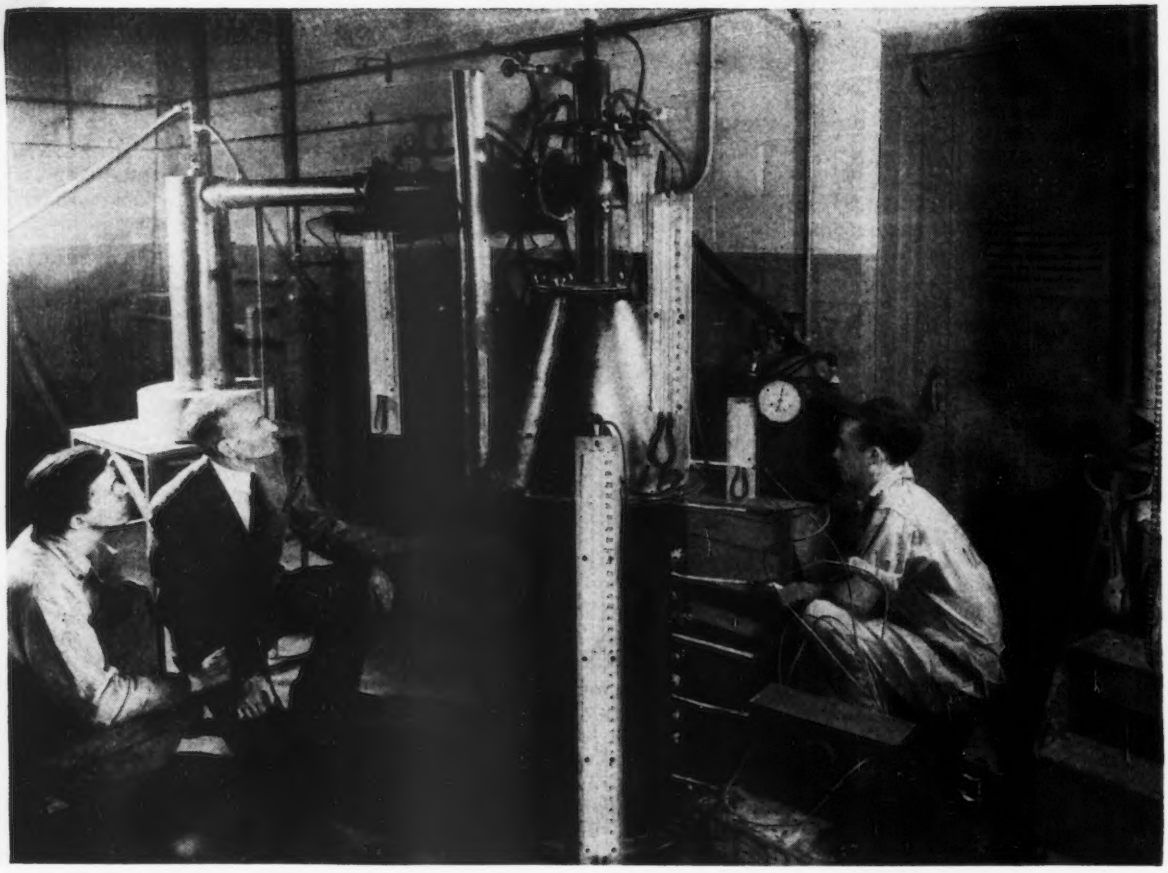
(g) Matrix. In many non-abrasive formations a low cost matrix, such as a beryllium copper cast matrix is the most economical. In other badly abrasive formations the tungsten carbide sintered matrix is essential if the diamonds are to be retained in the matrix during their useful life.

(h) Variables during Operation. Determination of feeds, speeds, start of drilling, quantity of water, and many other factors too numerous to mention greatly influence bit cost. These may be classed under the general term, "human element."

Summing It Up

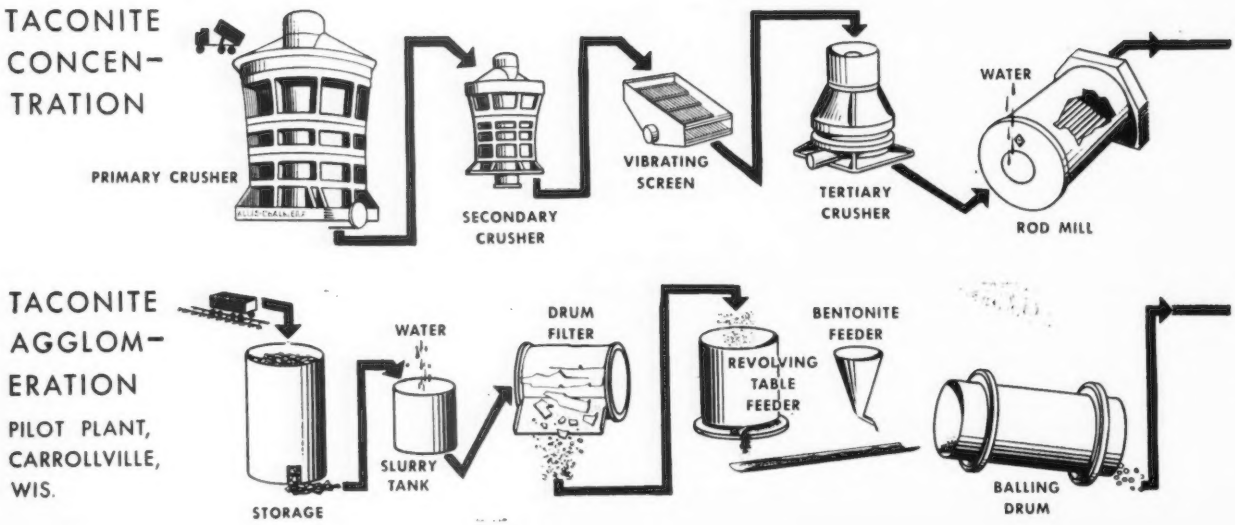
After using well in excess of 25,000 oriented bits in our Contract Department and after furnishing bit customers with many thousands more, we are firmly convinced that orientation is one of the major advances in diamond bit manufacture. However, orientation by itself can not magically produce a good diamond bit. Acceptable manufacturing practices and good bit design must be combined with orientation in the production of an effective bit which then must be used in accordance with normal accepted drilling practices and procedures.

Editor's Note. The Mining Congress article referred to was written by Adrian E. Ross, and Albert E. Long, Chief, Diamond Bit Research & Diamond Drilling Consulting Section, Mining Research Branch, U. S. Bureau of Mines.



EXPERIMENT MODEL of horizontal traveling grate pelletizing machine in Allis-Chalmers Research Division laboratories. Dr. O. G. Lellep who developed much of the heat transfer principles utilized, is shown between two engineers.

Down-Draft Pelletizing Is Chosen For Reserve's Taconite Project



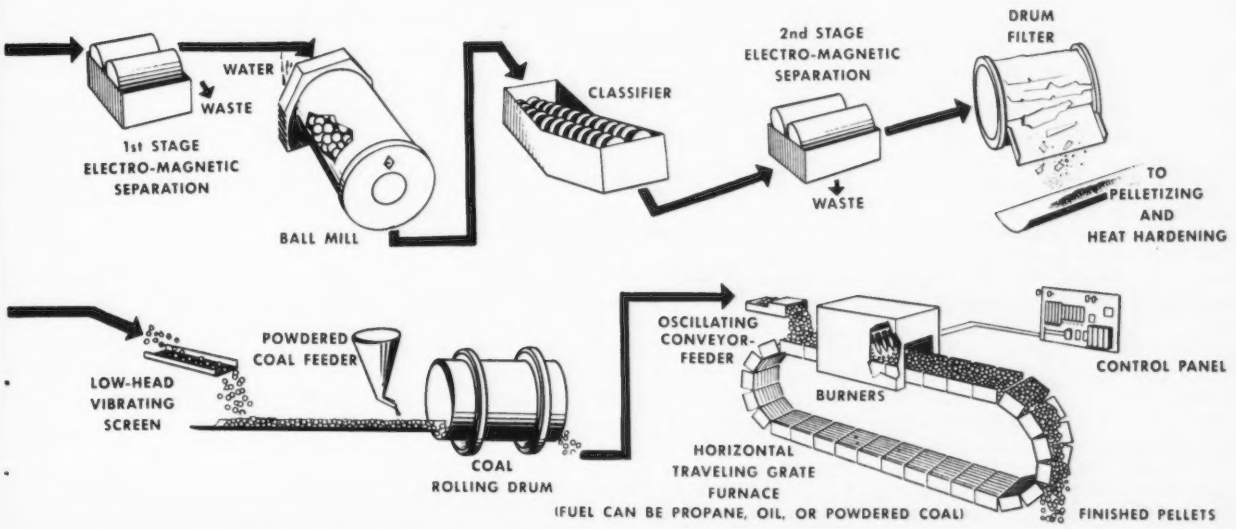
FIRST STEP IN PELLETIZING AND HEAT-HARDENING process developed by Arthur G. McKee & Co., and Allis-Chalmers is formation of balls in this machine. Vibrating screen separates undersize balls which return to feed end.

DOWN-DRAFT HEAT HARDENING will be used to pelletize taconite concentrate in the new E. W. Davis Works of Reserve Mining Co. at Silver Bay, Minn. Costing around $19-million, the new plant will be able to produce 12,000 tons of pellets daily.

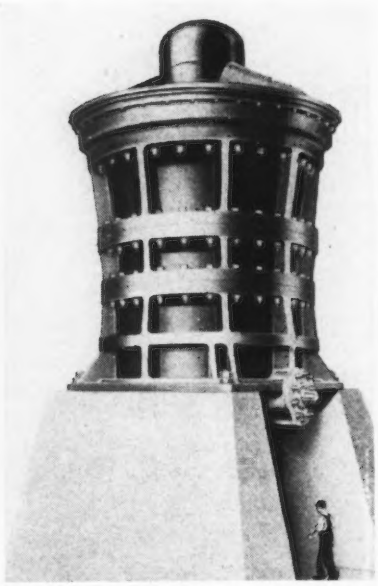
Design of the pelletizing process was worked out in the laboratories of the Allis-Chalmers Mfg. Co's Research Division and in a pilot plant operated by the company near Milwaukee in cooperation with Arthur G. McKee & Co., steel-plant engineering and construction firm of Cleveland.

An order for the design, engineering, and materials for the new pelletizing plant has been received by the McKee company from Reserve Mining Co., one of the two large taconite treatment projects now under construction in Minnesota. (See *E&MJ*, July 1953 p. 103.)

(Erie Mining Co., now at work on



HANDFULL OF HEAT-HARDENED taconite pellets ready for shipment from mill.



WORLD'S LARGEST GYRATORY will be shipped by Allis-Chalmers to Babbitt, Minn.

a taconite project to produce 7.5-million tons of high-grade iron concentrate pellets yearly, may use shaft-type furnaces to pelletize its concentrate. Cleveland-Cliffs in Michigan is testing an up-draft type of pelletizing furnace to treat somewhat similar material.)

In a joint announcement of the new development, Merrill Cox, vice president of the metals division of McKee, and Guy V. Woody, manager of the processing machinery department of Allis-Chalmers, said:

"Major advantages of this new metallurgical process for converting powdered taconite concentrate into an iron ore suitable for use in a blast furnace include:

"1, Its extreme simplicity of operation; 2, utilization of heat recovered from the operation; 3, ease of quality control resulting from the operator's ability to see what is going on during the process; 4, direct and simple discharge of the product from the equipment; 5, minimized breakage of pellets because of their stationary position on the grate which carries them through the furnace."

Taconite, the low-grade Minnesota iron-bearing rock that carries about 25 to 30% iron in either magnetic or non-magnetic form, will be treated by crushing, grinding, and magnetic separation. In the first large Minnesota plants, only magnetic taconite will be treated.

The product, running about 63% iron, is high enough in grade for good blast furnace feed, but is too fine (much of it being minus 325 mesh) to be fed to the furnaces directly. The burning process developed by Allis-Chalmers and McKee is aimed at pelletizing this fine concentrate into a product that will stand shipment down the Lakes and that can be charged into a blast furnace without undue dust loss.

Successful development of the process for heat-hardening pelletized taconite concentrate resulted from several years of fundamental research by the Allis-Chalmers Research Division, followed by extensive pilot plant testing of the process by engineers of Allis-Chalmers and the McKee company. During this intensive test period, hundreds of tons of taconite concentrate were processed into pellets in the pilot plant at Allis-Chalmers' Carrollville laboratory near Milwaukee.

In February 1954, a full-scale unit of the pelletizing furnace went into operation in Reserve Mining Co.'s pilot plant at Babbitt, Minn., producing 1000 tons per day.

Briefly, the process includes: 1, a balling drum in which taconite concentrate is rolled into balls about ⅜-in. to ⅝-in. in size; 2, a coal re-roll drum for coating the pellets with anthracite fines; 3, a traveling-grate type machine with down-draft combustion, in which the pellets are burned.

Shown in an accompanying flowsheet, the pilot plant included a repulping agitator and a filter so that concentrates could be repulped, then fed to the balling drum at a regulated moisture content of 10% moisture. This factor is quite critical, and the moisture content should be held within 9.5% and 10.5%.

Before entering the balling drum, the concentrate receives an additive, largely bentonite, which acts as a bonding agent to reduce breakage before the pellets get to the pelletizing machine.

The balling drum is simply an open drum set at a slight angle and continuously revolving. Concentrates enter at the higher end and pellets discharge at the lower end.

A classifying screen at the discharge end removes undersized pellets, which are returned to the feed end of the balling drum to act as "seed" pellets.

Correctly sized pellets (about ½-in.) go into a coal re-roll drum, where powered anthracite is made to coat the pellet surfaces. An oscillating feeder then drops the pellets onto the traveling grates of the heat-hardening furnace. Depth of bed runs up to about 15 in.

The pelletizing machine includes: A pre-drying zone where hot gases are pulled up through the bed; a drying zone, where a down-draft of hot air dries the pellets; a pre-heating zone, and finally an ignition and down-draft combustion zone.

In this final zone, temperature goes up to 2300 to 2400 deg. F. This ignites the top layer of pellets, and the burning zone then passes uniformly down through the bed of pellets.

About 40% of the total heat produced in the charge is self-generated. The rest comes from the coal. The burning zone passes down through the bed at the rate of about 1 in. per min.

Circulation of gases in the process is as follows: Air, drawn down through the far end of the machine to cool the pellets before discharge, circulates back up through the green pellets in the pre-drying stage as they enter the machine.

Down Draft Dries Pellets

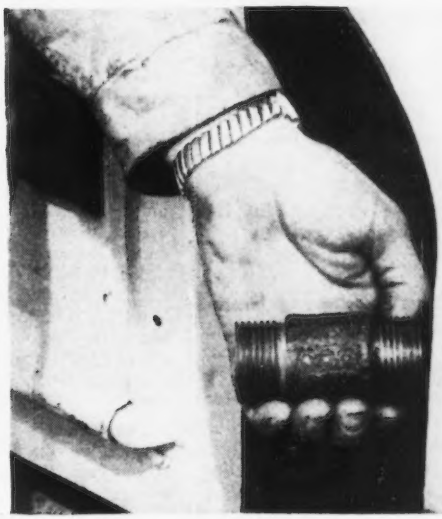
In the furnace itself, hot gas from the recuperation wind box first dries the pellets by down-draft through the bed. In the second stage, the pellets are pre-heated by means of a burner as well as by hot gases. In the third stage, a propane gas flame ignites the charge, and the ignition wind box gases exhaust to atmosphere.

The new plant to be built at Silver Bay will include seven units of the new pelletizing process, each able to produce about 1700 tons of pellets per day. The traveling grates on the full-scale machines will be 6 ft wide and the usable length of travel will be 168 ft.

It was pointed out that the process is applicable equally well to the concentrates from magnetic and non-magnetic taconite ores.

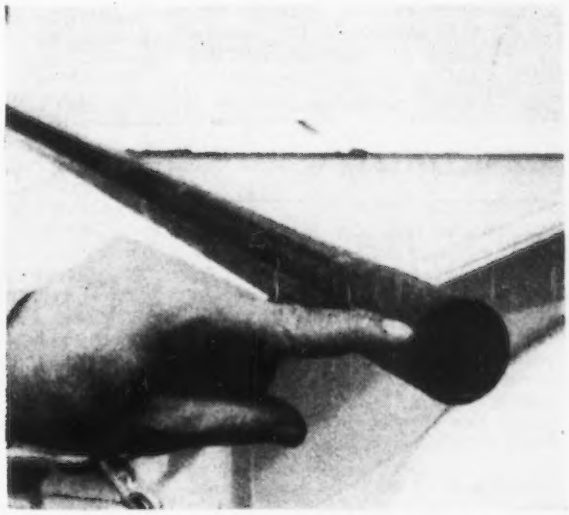
OPERATING IDEAS

VERNON STAGGS, general shop foreman for San Manuel points to hard-faced reamer inserted behind diamond drill bit.



TUBE BORIUM hard-facing is applied to the reamer. Areas containing commercial diamonds are not hard-faced.

CORE BARRELS are protected for a distance of 6 in. at both ends with a hard metal deposit containing tungsten and borium.



ANOTHER VIEW OF CORE BARREL showing how acetylene hard-facing technique is employed to protect the ends.

Hard-Facing Quadruples Life of Drill Parts

Vernon Staggs, general shop foreman for San Manuel Copper Corp., Arizona, developed an effective hard-facing technique for diamond core-drilling equipment after experimenting with many different types of welding rod. He found that by hard-facing core-barrels, flutes, and reamers with 30-40 Acetylene Tube Borium, wear on the equipment could be reduced substantially. In fact, drill parts which formerly wore out in 400 to 500 ft of drilling, now stand up for as much as 2,000 to 3,000 ft of exploratory diamond drilling.

It is now standard practice at San Manuel to hard-face reamer bodies on most of the outside diameter. Small areas where the diamonds are set are not hard-faced. Core barrels are protected by hard metal for a distance of approximately six inches. Wear at these points determines barrel life since internal threads are cut in both ends, and reduction in outside diameters weakens the threaded joints. Mr. Staggs also hard-faces the outside diameter of the flute which connects the core barrel to the drill rod. Accompanying illustrations show how the various parts mentioned above are hard faced.

Illustrations were provided through courtesy of the editors of FUSION FACTS, published by the Stoody Co., Whittier, Calif.

Depreciation

(*Continued from p 85*)

salvage value in 10 years by the straight line method, as compared to a rate of 25.9% by the diminishing balance method.

By making similar calculations for different periods of existence of an asset for various amounts of salvage value, one may compare the annual rate required to reduce the value of that asset to salvage by both the diminishing balance and straight line methods of depreciation.

The charts shown are drafted from schedules computed from these formulae. The chart shows comparative rates and years by the declining balance method and straight line method for assumed salvage percentages of original cost—from 5% in 5% intervals to 50%.

To illustrate:

(1) Refer to the chart illustrating salvage of 5%. The comparable rates in 10 years are 9.5% under straight line and 25.9% under the declining balance method.

(2) Refer to the chart showing 40% salvage. In 10 years the rate is 6% under straight line method and 8.9% under declining balance method.

NEW BOOKS

Lubricating Oils for Industrial Engines, published by the Internal Combustion Engine Institute, lists trade names of over 1200 lubricating oils offered by 366 oil companies as meeting certain requirements for heavy-duty industrial engines. Should be helpful to any engine owner who contemplates purchase of a specific oil. Pp 48. Price 20c. Internal Combustion Engine Institute, 201 N. Wells St., Chicago 6, Ill.

Handbook of Industrial Safety Standards. Ninth edition, published by Association of Casualty & Surety Companies, 60 John St., New York 38, N.Y. A compilation of industrial safety requirements recommended by nationally recognized authorities, covering many practices of the mining industry. Pp 315 plus tables and illustrations. Price $1.40.

Prospecting With a Counter. By Robert J. Wright, chief, geologic branch, exploration division, AEC Grand Junction operations office. Describes the use of radiation detection instruments in prospecting for uranium ores; it is a revised edition of RME-4028, by the same author. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Pp 68. Price 30c.

Correlation Chart of Uranium-Bearing Minerals. J. H. Heinicke, member of the staff of the Colorado School of Mines Research Foundation, Inc., Golden, Colo. The chart, 50x32-in., contains over 160 uranium-bearing minerals and is divided vertically into chemical radical columns and horizontally into chemical-element bands. There are 15 different color bands on the chart for greater visual ease of correlation. Practically all physical characteristics necessary to identify the minerals are given under each one. Price, $5.

Bibliography and Index of Literature on Uranium and Thorium and Radioactive Occurrences in the U.S. By Margaret Cooper, division of raw materials, AEC. Published by the Geological Society of America, 419 West 117 St., New York 27, N.Y. **Part 2:** California, Idaho, Montana, Oregon, Washington and Wyoming. Pp 69, price not specified. **Part 3:** Colorado, Utah. Pp 124, price 50c.

Canadian Mines Handbook 1954. The new pocket-size handbook lists over 900 active companies, approximately the same number as in 1953. Almost 200 new companies were formed during the year, while 44 inactive organizations revived, but a corresponding number of companies have become idle. The book's inactive section lists more than 7600 companies, to make a total compilation of more than 8500 mining company names.

Included as usual are the special sections: "Metal Mines Classified," in which producers of each of the principal metals are listed; and the eight-year range of mining share prices

Published by Northern Miner Press, Ltd., 122 Richmond Street West, Toronto 1, Canada. Pp. 352, Price $3.

Flow of Bulk Solids. By Andrew W. Jenike. Bulletin No. 64 of the Utah Engineering Experiment Station, University of Utah, on this subject is divided into two parts: Part I. Flow of Solids in Bulk Handling Systems; and Part II. Flow of Bulk Solids in Bins. Purpose of this book is to develop quantitative design data for flow of bulk solids in bins, hoppers, and chutes. A theory explaining flow is developed, and a property of bulk solids which governs flow, called a "flow-factor" is discussed. Formulas of flow have been developed in general form. Certain coefficients for these formulas have been computed, but others remain to be determined experimentally.

The author examines the reasons for obstruction of flow of solids in bins, and analyzes pressures that build up in bins to deter free flow, even though the material itself is free-flowing when not confined.

Published by the University of Utah, Salt Lake City, Utah. Pp 43, including numerous sketches and diagrams.

Preliminary Report on the Geology of Parts of Long and Spragge Townships Blind River Uranium Area, District of Algoma. By E. M. Abraham. No. P.R. 1953-2. Published by the Ontario Department of Mines, Toronto, Ontario, Canada. Pp 10 plus map.

Mining Geology of the Seven Devils Region. By Earl Ferguson Cook. Pamphlet No. 97. Published by the Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp 22 plus maps.

Geological Reconnaissance Across the Great Northern Peninsula of Newfoundland. By C. E. Fritts. Published by the Department of Mines and Resources, Province of Newfoundland, St. John's, Newfoundland. Pp 27 plus maps.

Alloy Steels Pay Off. A series of case histories showing how alloy steels increase performance and cut costs. Published by Climax Molybdenum Co., New York 36, N. Y. Free to readers who request copies on company letterhead. Send request to Climax Molybdenum Co.

Sulphur. System No. 9, Section A3 of the 8th Edition of GMELIN'S Handbook of Inorganic Chemistry. Edited by the Gmelin Institute. Topics covered in this text include the physics and chemistry of elemental sulphur, purification of sulphur in the laboratory, concentration of sulphur istotopes, nuclear and molecular structure of sulphur, electrochemistry of sulphur, and non-aqueous solutions of sulphur. Published in German by Verlag Chemie, GmBH., Weinheim, Germany. Available at Walter J. Johnson, Inc., 125 East 23rd St., New York 10, N. Y. Pp 275. Price $34.00.

Air Pollution Abatement Manual. Edited by C. A. Gosline. With the completion of chapter II, "Terminology and Delected Data," by Willard W. Hodge, the complete manual is now available from the Manufacturing Chemists' Association, Inc., 1625 Eye St. NW, Washington 6, D.C. Eleven other chapters, plus a preface and an outline of the manual have been previously published as separate prints, ranging in price from 15c to 75c. The manual has been prepared to assist industrial and government personnel in achieving the most effective abatement of air pollution at the lowest cost. Single copies free on request to officials in air pollution abatement work, others $6 per full copy, including binder.

Safety in Quarry Operations. Revised and expanded edition of National Safety Council publication discusses specific problems of workings, explosives and transportation, and recommended safe practices. Pp 40 plus photographs and diagrams. Published by the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. Price $1.25 to members and $2.50 to nonmembers.

Elements of Structural Engineering. By Ernest C. Harris, Chairman Department of Civil Engineering and Engineering Mechanics, Fenn College. Written especially as a textbook for non-civil engineering students to impart a thorough concept of structural engineering for students in other fields. Published by Ronald Press Co., 15 East 26 St., New York 10, N.Y. Pp 505. Price $7.

RESULTS OF AN INTELLECTUAL REVOLUTION . . .

"The Western Miracle" Continues . . . More Automatic Controls for Industry

Within recent weeks three new monthly technical magazines devoted to automatic control systems for industrial processes and machinery have offered the public their first issues. One of these is CONTROL ENGINEERING, a McGraw-Hill publication.

What has caused this surge of interest in the design and application of automatic control systems? What does it portend for the future of American industry? More important, what does it promise for the American standard of living, of which industry is and must be the servant? And what is the role of CONTROL ENGINEERING in this development? It is to those questions that this statement is addressed.

A New Intellectual Revolution

It is frequently asserted that we are now in the throes of a new industrial revolution. The revolution is described as the eliminating of wasteful applications of human labor to repetitive tasks through new technology which makes it possible to transfer those tasks to automatically controlled machinery.

It is perhaps more accurate, however, to say that we are the beneficiaries of a new intellectual revolution in the application of science to industry. This new intellectual revolution points the way toward giant strides in the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control.

The practical engineering work required to convert this intellectual revolution into a full-scale industrial revolution, however, in large part still remains to be done. It is to this task that CONTROL ENGINEERING will be devoted. Its role is that of bridging the gap, in engineering and economic terms, between the new conceptions of automatic control of industrial processes and their practical workaday application. These conceptions run the full gamut from systems of control for automatic factories making heavy industrial products to highly personalized systems of automatic control to warn people when they are approaching the broiling point in sunning themselves at the beach or becoming too drowsy to drive their cars safely.

Enter the "Feed-Back" System

Enough work has been done to move these conceptions out of the realm of interesting dreams and into the realm of practical possibilities, and in some cases into the realm of practical realities. Crucial parts of this work were done during World War II when weapons were successfully equipped with "feed-back" systems

that automatically corrected mistakes made by the weapons in locating their targets.

The principle of the "feed-back" system is as ancient as the personal monitor that tells us not to run into each other as we walk along the street. It feeds back to our locomotion machinery the warning of a collision ahead. But the application of the principle to weapon control and then to more general machinery control required superlatively imaginative and skillful scientific development.

When a "feed-back" system that monitors an automatic process and keeps it lined up precisely is teamed up with a computing machine, capable of making lightning calculations that control both what goes into the process and what is done with the product, the horizons of automatic control become broad indeed. But in large part they still remain horizons. A vast range of practical engineering work remains to be done to realize anything like the full potential of automatic control of industrial processes and machinery.

More and Better Jobs

There are those who view the surge of interest in automatic control with alarm. They conjure up a situation in which automatic processes will at once expand the ranks of the unemployed and reduce many of those still working in industry to the status of robots or automatons.

A look at the record of the American economy — a record of amazing growth, steadily improving job opportunities and a constantly rising standard of living — demolishes the basis for such fears. The introduction of new and more efficient industrial machinery and processes obviously cannot be accomplished without creating some disturbance for some individuals and some companies. But consistently the longer range effect of such local and temporary disturbance has been more jobs and better jobs for Americans.

It is no accident that, while the proportion of industrial wage earners in our population is virtually the same as it was in 1920, the proportion of professional and salaried workers has doubled. The proportion of unskilled workers, furthermore, has dropped by half. This has been an essential part of a continuing process by which drudgery has been transferred to machines while the workers who formerly did the drudgery have been graduated to jobs calling for greater competence and providing better pay.

Higher Living Standard

A British historian, H. J. Hancock, has referred to this general process as "the Western miracle" — that of providing an ever higher and higher standard of living for more and more Americans. The key element in this miracle has been more and more reliance on power-driven machines to get the day's work done.

In the nature of the extremely complicated apparatus involved, full development of systems which have passed through the "think stage" into the status of practical possibilities will be a time-consuming process. It will also be a very exacting process, calling for a tremendous application of engineering skill and ingenuity. However, the engineers who are concentrating on this difficult, workaday phase of the development of apparatus for automatic control will be inspired by the knowledge that they are making a crucial contribution to technical progress which holds great promise of good for the American people.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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Handling Iron Ore Tailings at 20° Below with the Dorr 4-Arm Torq Thickener

This 150′ dia., extra heavy duty Dorr Torq Thickener is in operation at the Pilotac Concentrator of the Oliver Iron Mining Division of U. S. Steel Corporation, Mountain Iron, Minnesota. It thickens 100 to 120 long tons per hour of minus 100 mesh tailings. Feed contains 7 to 12% solids; overflow rate is approximately 4500 gals. per min. Thickener underflow contains about 50% solids.

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For more information about the advantages of the 4-Arm Torq and the complete Dorr Thickener line, write for a copy of Bulletin No. 3001, The Dorr Company, Stamford, Conn.
In Canada, 26 St. Clair Avenue, East, Toronto 5.

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Enthusiasm Over Uranium Sets Pace

KEYED UP by excitement and speculation over uranium, nearly 7000 registrants made the San Francisco meeting of the American Mining Congress, Sept. 20-24, one of the biggest and best ever held.

Exhibits by 159 of the nation's leading manufacturers of mining and metallurgical equipment set a new high for scope, size and variety of equipment shown.

Many uranium operators expressed both dissatisfaction over current handling by the AEC of the industry's problems and over the outlook for continued uranium purchases. Reassurance was given on both points by Jesse Johnson, AEC Raw Materials director, who indicated that 1962 will probably not see the end of the AEC's buying program. He urged continued exploration and development in this field. Commercial atomic power will be produced at competitive rates within 10 yr, he felt.

Sheldon P. Wimpfen, manager of the AEC's Grand Junction office, reported that Plateau ore production has doubled every 18 months since the buying program started.

Appointment of a cabinet committee to guide President Eisenhower in policy-making in the minerals field was cited by Felix E. Wormser, assistant Secretary of the Interior, as indicating the greater attention now given in government circles to mining problems.

That government could not solve these problems alone, was the conclusion many reached after hearing Miles P. Romney, manager of the Utah Mining Association, call for a better job of "grass roots" public relations by mining companies in their own communities. He offered evidence that a much better job was easily possible than was now being done.

In the technical sessions, much interest was shown in a plea by Thomas M. Ware, vice president of International Minerals & Chemical Co., for use by the mining industry of the scientific approach to equipment design and operation now proving so successful in the manufacturing industries. With greater output-per-man-hour being required in the future, the only way to get it at lower cost, Mr. Ware said, was to apply every new tool and idea available. As examples, he cited his company's use of newly designed shovel controls and of intricate mathematical analysis, both of which have stepped up dragline shovel output for I. M. C.

Reports on the equipment show, further details on the papers given and an eye-witness account of the ladies' activities at the meeting will appear in following issues. Meanwhile, among the most interesting were the sessions on underground mining, open pit mining, milling, drill steel, uranium, titanium and nickel. Excerpts from those sessions follow:

Underground Mining

M. K. Hannifan, assistant general superintendent, Anaconda Copper Mining Co.'s Kelley Mine in Montana, told delegates that his experience "has proven that block caving is successful as a mining method to be applied to previously stoped ore zones."

Hannifan explained that the problem of plugged main raises from haulage to grizzly level and consequent damage to chutes from blasting can be entirely eliminated through use of a slusher gravity-type block. Effectiveness of concrete support has made this type block possible as well as improving ventilation and ore-drawing efficiency . . ., Hannifan added.

J. F. Buchanan, mine manager, San Manuel Copper Corp., Tiger, Ariz., told his audience that San Manuel currently is developing the first block of its sulphide orebody to be mined by block caving methods and that mine output of 35,000 tons per day will begin in 1956.

Guy N. Bjorge, vice president, Homestake Mining Co., San Francisco, described how the use of 'friction-type" mine hoists during this century has increased rapidly and is now almost universal in European mines. He pointed out that the first major installation of this type hoist is now being made by Cleveland-Cliffs Iron Co. at Ishpeming, Mich. Falconbridge Nickel Mines Ltd. of Canada is to install two such hoists during 1955, he added.

Bjorge listed these advantages of the friction-type hoist: increased safety in operation; less rope wear, lower peak power demand, lower power consumption and lower lost of equipment and hoist house.

L. F. Snow, general foreman of drilling and blasting for Kennecott Copper Corp., told how development and use of a special mobile mine drill had been responsible for revolutionary changes at Kennecott's Utah Copper operations.

Snow said that use of mobile drills reduced employees of the Drilling & Blasting Department by 34%; retired 60 mi of compressed air line; eliminated annual cost of $105,000 for operating a central compressed-air plant, and retired 94 conventional drills and accessories.

H. L. Miller, assistant superintendent of mines at Mascot, Tenn., for American Zinc Company of Tennessee, stated that airleg drills had replaced all column-mounted drills in mine stopes at his operation.

Miller said that airleg drills have more than doubled drilling speed and have boosted tons-per-machineman-shift from 39 to 67.

H. H. Wells, superintendent, Lark Section, U. S. Smelting, Refining & Mining Co., Lark, Utah, said that mechanical handling has reduced manpower requirements and accidents, increased available storage space and expedited delivery of supplies into the mine. Wells added that savings resulting from use of mechanical handling at the mine since the program began in 1949 have amounted to 28%.

Harold B. Ewoldt, vice president, White Pine Copper Co., White Pine, Mich., found an attentive ear when he described mining and milling methods. The dome-shaped, bedded ore deposit and its two main zones of deposition present somewhat different mining problems.

Ewoldt said that the operation utilizes diesel-shuttle-car haulage, underground crushing and belt conveyors. He explained that the underground crushing station is 3600 ft from the entrance and has 5000 tons storage capacity. A 54-in conveyor belt moves the ore to the surface in two lifts on a 16% grade.

S. W. McDougall, manager of mines, and **E. B. Olds,** mine foreman, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, told how use of mechanical mucking and an intermediate transfer of broken ore from sinking buckets to skip hoisting enabled them to deepen an Idaho mine shaft 2000 ft in slightly more than 11 months.

They explained that among factors which contributed to this fast rate of progress—8.4 ft per shaft sinking day—were a bonus incentive plan for the entire shaft crew and drifter drills on pneumatic columns for drilling with higher-than-average mine air-pressure.

L. T. Postle, vice president-general manager, Granby Consolidated Mining, Smelting & Power Co. Ltd., revealed that experiments at the Copper Mountain, British Columbia, mine clearly indicated the superiority of percussion drilling over diamond drilling.

Here's What You Heard Most Often at the San Francisco AMC Meeting

Gosh, I wish I lived in San Francisco!

I meant to get over to see you but we met these people from Salt Lake, and . . .

I know he's here at the meeting, but . . .

She's really the nicest person, but honestly, that dress!

Say, how do you get to the Top of the Mark?

Isn't that Charlie Steen over there?

And you can get the nicest cultured pearls there for only . . .

Which way to Fisherman's Wharf?

Boy, did we have a time last night!

Well, it's been nice seeing you.

at AMC Convention in San Francisco

H. A. London, superintendent of maintenance, Duval Sulphur & Potash Co., Carlsbad, N. M., traced the rapid and continuing growth of diesel power equipment in underground mining.

London said that "Diesel power was chosen for underground usage . . . because the engines can be tuned to such a degree that toxic gasses can be held within limits and the fire hazard from fuel storage is not as great as with gasoline."

Earl H. Miller, U. S. Potash Co. mine in Carlsbad, said that diesel engine use underground is made possible by use of exhaust scrubbers which cool 850 deg. F. exhaust gases to less than 180 deg. F. and remove objectionable aldehyde odors.

Open Pit Mining

Lewis A. Parsons, consulting engineer, Calaveras Cement Co., San Francisco, said that his company purchased its first rotary drill unit in December 1951 in the hope of bringing about economies in blast-hole drilling. This resulted in such great economy and increased speed that the company in December 1953 decided to buy even heavier rotary drilling equipment, Parsons said.

He disclosed that at the Calaveras quarry hole-spacing with 9-⅞ in. hole is on 21-ft centers, resulting in breakage of 35 tons a foot of depth with an average powder consumption of 0.33 lb per ton broken.

G. W. Colville, assistant general manager and chief engineer, Bagdad Copper Corp., Bagdad, Ariz., told of how use of belt conveyors aided Bagdad's shift from underground mining to open pit.

Colville listed the following advantages which, he said, were realized by installation of open pit belt conveyors: number of mining shifts was reduced from 21 to 12 a week; cost of transporting ore to the secondary crushing plant was drastically cut; capacity of ore storage between mine and crushing plant was multiplied five times, and when a second stage of crushing was provided, the capacity of the crushing plant was increased and permitted the addition of another grinding section in the mill.

The conversion from underground to open pit resulted in an increase of mined tonnage from 682,000 tons in 1944 to 1,230,000 tons in 1953, Colville disclosed.

J. C. Van de Water, general superintendent of mines, Ray Mines Division, Kennecott Copper Corp., described operations at the Ray Mine in Pinal County, Ariz.

Van de Water that "One of the most economical features of mining old caved areas lies in the fact that most of the ground is already broken and requires very little if any drilling and blasting. In the total open pit cost figure, this is quite a large item of expense and its partial elimination can make a radical change in economic planning for open pit mining," Van de Water pointed out.

T. A. Snedden, manager, Southwestern Division, American Smelting & Refining Co., said that modern pit equipment, milling practices and truck haulage have made feasible continued operation of the Silver Bell copper mine in New Mexico.

Snedden revealed that Silver Bell is a 7500-ton-a-day open pit operation of two orebodies with a reserve of 32-million tons. Average assay of the two pits, he said, is 0.9% copper and the combined stripping ratio for both is 1.2 waste to 1 ore. The pits are 4 mi apart, he added.

Milling

R. H. Lowe, Mineral Dressing Department, American Cyanamid Co., St. Louis, discussed heavy density milling processes in use today.

Lowe told delegates that heavy density processes employ relatively stable suspensions of solids in waters as the media. The trend is toward use of magnetic media, he added, and the majority of all plants in operation in the world use this type.

Drill Steel

R. J. Marcotte, Calumet Division, Calumet & Hecla Inc., Calumet, Mich., reviewed the program initiated by C&H during a period of poor drill rod performance, which, he said, has resulted in a better than three-fold increase in rod life.

T. E. Norman, metallurgical engineer, Climax Molybdenum Co., Denver, in speaking of possible improvements in the life of percussion drill rods, said that factors of design, metallurgy and surface treatment all must be considered and coordinated with definite plans for quality control.

According to Norman, a large proportion of drill rods now in use have a normal service life of 1-5 hr. "By introducing improvements which appear possible for these rods, an increase in service life to more than 50 hr of drilling may be realized."

Floyd R. Anderson, chief metallurgist, Gardner-Denver Co., Denver, told of two methods for improving quality of drill steel.

Anderson cited the strengthening of drill rods by mechanically introducing favorable stresses in the surface as well as improved design features. He pointed out that mechanical factors often may outweigh metallurgical considerations in improving drill steel quality.

B. F. Shepherd, chief metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J., pointed up the problems and value of research on improving drill rod performance.

Shepherd said that the maximum potentialities of percussion drilling are obtained only if proper attention is given to drill steel. He commented that everyday controls to effectively utilize the available tools and scientific research on the problem of transmission of energy through long slender columns have resulted in considerable progress toward improving efficiency of percussion drilling methods.

W. F. Towne, metallurgical supervisor, Bethlehem Steel Co., Bethlehem, Pa., summarized essential steps in developing material for hollow drill steels.

Peter Payson, Crucible Steel Company of America, discussed latest methods of treating steel for drill rod purposes. He explained that the heat treatment of steel consists primarily of heating and cooling.

Uranium

E. V. Reinhardt, Hunt Oil Co., Grand Junction, described geologic structures of the Colorado Plateau. Superimposed on the great dome of the Plateau are many smaller domes ranging in length from 40-100 mi, including six mountain groups, he said.

Reinhardt commented that "All the major mines are on the crests or upper flanks of the lesser domes or in belts around the mountain group." He stated that a fracture control is obvious in some mines, obscure in others. Reinhardt added, however, that he believed that a fracture control eventually would be found for every deposit on the Plateau.

Lincoln R. Page, USGS geologist from Denver, stated that uranium ore from 71 mining claims in the Black Hills of South Dakota and Wyoming has been sold to AEC.

Page said that ore output to date has been from small, near-surface deposits in Cretaceous sandstones but, he added, recent explorations indicates presence of larger deposits at depths of more than 100 ft. He described the yellow carnotite and black corvusite ores found in the Black Hills.

Titanium

Edward R. Rowley, president, Titanium Metals Corporation of America, New York, disclosed that titanium production in the United States has doubled each year since 1950 and may reach 35,000 tons by 1957.

Nickel

A. E. Walker, geologist, The M. A. Hanna Co., disclosed that exploration by churn drilling and bulldozer trenching of the Riddle nickel deposit at Douglas, Ore., has proved up a substantial tonnage of ore with an average nickel content of 1.5%.

Walker explained that "Chalcodeny boxwork has formed in large areas of peridotite that are sheared and fractured. Nickel ore in the form of concentrated garnerite is disseminated throughout this zone."

He added that an electric smelter is being erected at Riddle by the Hanna Nickel Smelting Co. When this smelter begins operation, Walker said, it will produce ferro-nickel.

 (Continued from page 69)

Zinc Ore Production by Countries

(American Bureau of Metal Statistics)

The following summarizes the production of zinc ore concentrates in terms of zinc contained by important countries so far as figures are available. In addition to Russia and countries under Russian influence, countries missing are Yugoslavia, Peru, and the Belgian Congo. Monthly figures for Bolivia are not available, but production for 1953 was 26,427 tons. Figures in short tons.

	Jan.-Dec. 1953	Jan.-Mar. 1954	Apr. 1954	May 1954	June 1954
United States	534,730	118,226	39,945	40,031	40,540
Canada	400,041	80,832	31,528	30,082	.....
Mexico	220,252	55,818	18,439	18,677	19,084
Argentina	17,735	5,430	1,466	1,323	1,680
Fed. Rep. of Germany	100,579	26,106	8,579	8,611	8,535
Italy	91,155	23,931	7,590	8,740	7,250
Spain	89,532	21,938	7,129	7,726	7,628
Sweden	45,788	6,841	6,075	7,651	.....
Australia	223,004	68,840	23,600	25,869	27,722
Japan	105,891	29,261	.....	.....	.....
North Africa	63,893	15,715	6,393	6,195	.....
South West Africa	14,672	5,464	1,644	1,912	1,540
Northern Rhodesia	39,023	9,363	2,964	3,050	2,623
Totals	1,946,295	467,765	.....	.....	.....

Iron Ore Imports

Iron ore imported for consumption in the U.S. in June and the six months that ended on June 30, in gross tons, according to the Bureau of the Census:

	June 1954	Jan.-June 1954
Algeria	.....	19,000
Brazil	74,926	301,916
British W. Africa	30,500	130,422
Canada	246,052	401,458
Chile	133,290	839,108
Cuba	2,000	27,481
Dominican Republic	14,460	70,015
Iran	2,953	2,953
Liberia	113,521	341,091
Mexico	15,761	62,551
Panama	.....	3,800
Peru	176,610	1,098,535
Spain	.....	235
Sweden	142,623	676,835
United Kingdom	.....	179
Venezuela	542,934	2,046,701
Total	1,495,630	6,022,280

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

September 30, 1954

Aluminum ingot, 99 plus percent, lb.	22.2¢
Antimony, spot, lb., less than carload, in cases	31.97¢
In bulk, carload lots, f.o.b. Laredo	28.50¢
Bismuth, ton lots, lbs.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.70
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢
Palladium, troy oz.	$19 @ $21
Platinum (Official quotation wholesale lots) troy oz.	$84.00 @ $87.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$325 @ $328
Selenium, 99 plus percent, lb.	(b)$5.00 @ $6.00
Silicon, minimum 97 percent, carloads, lb.	18¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, grade A, lb.	$4.72

(a) Includes U. S. duty. (b) Depending on quantity.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$42.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:	
44% Cr_2O_3 no ratio	$21.00 @ $22.00
48% Cr_2O_3 3 to 1 ratio	$43.00 @ $46.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.30
Mesabi bessemer	$10.05
Mesabi, non-bessemer	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$184.25
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 70 @ 75¢ c.i.f. U. S. ports, duty extra. Long-term contract nominal at 65 @ 70¢ c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢
Columbium-Tantalum, per lb., combined oxides	$3.40
Tungsten Ore, per unit of WO_3:	
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$24.00 @ $25.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$68.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢
Ferromanganese, 74–76%, net ton, seaboard	$190
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si	12¢
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.80
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes f.o.b. cars:	
Georgia, crude, per ton	$15.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton.	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective, ton	$32.00 @ $33.00
60% effective CaF_2	$28.00 @ $29.00
Acid 97% concentrate, bulk, ton	$52.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines, Punch 12 to 22¢ per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢ to 85¢.; 2 x 2 inch, $1.10 to $160; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.	
Ocher, Georgia, ton, in sacks	$26.50 @ $30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$13.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$64.00
Structural shapes, 100 lb.	$4.25

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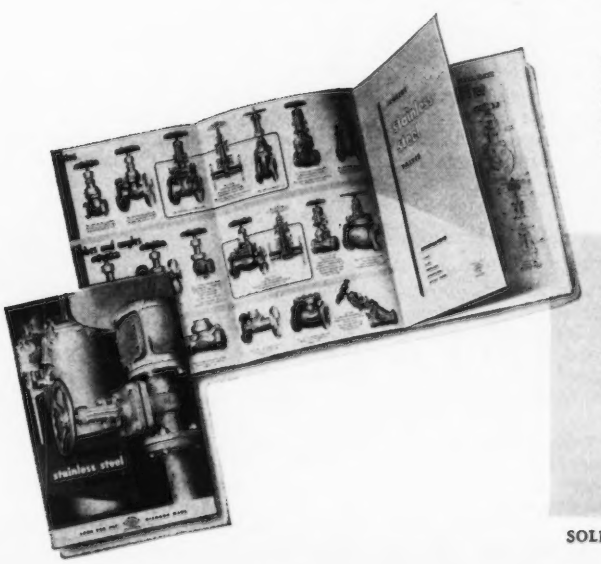

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

New Farm Surplus Law Seen As Potential Trap for Miners

NEW FARM SURPLUS DISPOSAL LAW, which expands the Government's authority to swap surplus agricultural goods for metals and minerals, is a potential booby-trap for domestic mining.

That's the view of several Washington officials close to the industry. They feel that unless the law is administered carefully—and under the scrutiny of mining men—the law could be a "deathblow" for domestic mining. They consider the new law a departure from previous Government policy because it makes disposal of farm surpluses the first order of business, perhaps at the expense of U. S. miners.

Agriculture Department has bartered surplus farm goods for strategic materials before. But this has been a relatively minor program. In the past three years, about $75-million worth of goods has been swapped—mainly wheat, corn, and tobacco for industrial diamonds, metallurgical chromite, and mercury.

The volume of barter has been kept down by Agriculture's policy of acquiring only materials that could be resold to GSA for the national stockpile or to other Government agencies. Under the new law, this restriction is knocked out. Congress has demanded a broader policy; it wants to get rid of farm surpluses in a big hurry.

There are two main parts to the new law. Title I provides for the sale of $700-million worth of farm goods for foreign currencies, rather than dollars; the funds to be put in a special budget bureau fund, then later doled out to individual government agencies for expenditure abroad. The money will be used to pay U. S. obligations overseas, for loans "to broaden multilateral trade and economic development" (which may be repaid in strategic materials), to procure goods and services for other friendly countries, and for related purposes.

Another authorized use for the foreign currencies—and maybe the most important—is to buy strategic materials for a "supplemental" U. S. stockpile over the next 10 yr. This would take materials already in excess of the national stockpile's long-term objectives. The President's rejection of lead-zinc tariff hikes referred to the supplemental stockpile as a way to absorb some foreign lead-zinc surpluses. Supplemental stockpile materials will be protected by the same provisions covering the regular stockpile.

The other part of the new law, Title III, affects disposal of a greater quantity of farm surpluses through barter, probably the $2.5-billion worth of goods set aside for isolation from the farm market in connection with the Administration's flexible price support plan.

Supplemental stockpile acquisition under Title I will be controlled by ODM, with an eye to future needs of the regular stockpile. But the underlying aim will be to get rid of surplus farm goods. Title III acquisition of metals and minerals, it now appears, will be handled directly by the Agriculture Department. An Agriculture official explains Departmental policy this way: The main objective is to protect Commodity Credit Corp. assets—by swapping perishable farm goods for non-perishable metals and minerals. The only specific limitation of transactions will be "just good business sense."

A factor favoring U. S. miners does exist, however, which may put the brake on bartering of farm goods for metals and minerals. In general, sales of metals and minerals represent important dollar earnings for foreign mining countries. The question is whether these nations would take their own currencies or surplus farm goods in return for their own products.

The new law was drafted by the Senate Agricultural Committee during the Congressional rush to adjourn this summer. It was not an "Administration Bill". Mining men had no say on provisions covering acquisition of strategic materials.

As the critics now see it, the Government might become a speculator in foreign currencies under the new law, since use of local funds to buy materials may be held up for some time. In addition, the critics look at the program as a means to swap one surplus for another. The assumption is that a surplus of metals and minerals is more durable—and less politically embarrassing—than a surplus of agricultural goods.

Uranium Stock Sales Crackdown

AN OFFICIAL CRACKDOWN on wildcat sales of uranium securities is shaping up. SEC officials are reluctant to talk about it. But it's no secret that the Agency's top priority project these days is to check unregistered uranium security offerings and fraudulent claims by stock sellers.

So far, "stop-order" proceedings—to determine whether to suspend the sale of stock—have been held or scheduled for two firms, and three cases have been brought to court to enjoin further issuance of uranium securities. But you can expect a spurt of new actions.

The crackdown began in June, when SEC dispatched a team of top-level officials from Washington to Denver and Salt Lake City to "survey" sale and trading of uranium stocks in the west, then quickly announced the fact. The following month, SEC opened a new office in Salt Lake City.

SEC's announcement of the field investigation was unprecedented. It was done deliberately to tip off its concern about uranium.

An official has outlined some typical claims illegally made in uranium stock offerings studied by SEC. Presumably, such claims are getting special attention. He cited statements (1) on number of uranium claims for which the issuer holds assignments of option, and the quantities of ore found; (2) concerning value of uranium produced in a specific state; (3) related to prices of uranium; (4) that the issuer's stock will be traded on the over-the-counter market and listed on an exchange shortly and will be selling for a specified price per share; (5) that only a small amount of the issuer's stock remains unsold; (6) that the issuer is in production now; (7) that the issuer has great quantities of uranium ore on the surface of the ground to be obtained without digging.

Greater Titanium Expansion

A SECOND ROUND of Government-sponsored titanium expansion is in the works. Behind it is a new stockpile objective just established for the metal, based on projected military requirement for titanium in wartime. Actually, consumer demand now hovers below output, mainly because industry has been hesitant to venture into titanium, feeling unsure about firm supply sources.

The new round will call for considerable expansion beyond the present 30,000-ton annual goal by 1957. How much is still a tight secret. At press time, GSA had lined up production of 22,500 tons through purchase commitments and other subsidies with Union Carbide & Carbon's electromet division (7500 tons), Crane Co. (6000 tons), DuPont (3600 tons), Titanium Metals Corp. (3600 tons), Dow Chemical (1800 tons). A second contract with DuPont, calling for 7500 tons additional capacity, was about to be signed, to close up the first round of expansion.

Only DuPont and TMC are in production; the other plants still are under construction. In addition, GSA has made a loan to Horizons Titanium for construction of a pilot titanium plant (to test a new process) and has leased an idle magnesium plant to Western Pyromet Co. for other pilot operations.

GSA still has five titanium contracts under negotiation and 12 contract pro-

SOUTHERN LIGHTWEIGHT AGGREGATE CORPORATION CHOOSES KENNEDY EQUIPMENT

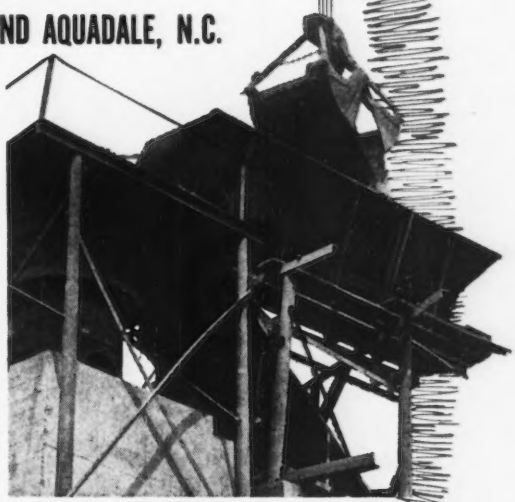
FOR "SOLITE" PLANTS AT BREMO BLUFF, VA. AND AQUADALE, N.C.

KVS Gyratory and Swing Jaw Crushers, Vibrating Screens, Rotary Kilns and Conveyors provide ideal equipment for capacity, controlled production and handling of a wide variety of aggregates. For example:

In the two modern plants of the Southern Lightweight Aggregate Corporation at Bremo Bluff, Va., and their subsidiary, Carolina Solite Corporation at Aquadale, North Carolina, this Kennedy equipment makes it possible to maintain heavy production schedules at low operating cost.

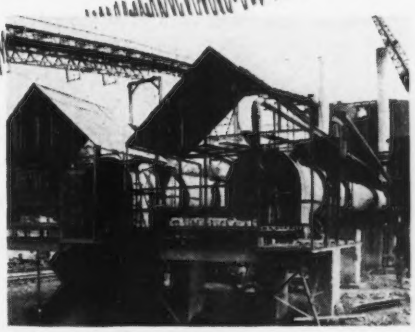
KVS machinery is designed and engineered for low cost production . . . peak capacity . . . long life . . . low maintenance cost. This world-famous equipment includes *more* exclusive built-in features than any other made . . . patented operational features . . . job-proved by plant operation records . . . that *assure* satisfactory service and freedom from time-consuming down time under the most severe operating conditions.

All KVS equipment is built to meet specific needs in any size, capacity or dimension required. Our sales-engineering department is available for consultation on any problems of aggregate production.



A close-up of the KVS screen and secondary crusher, employed in plant of Southern Lightweight Aggregate Corporation at Bremo Bluff, Va.

KVS Ball Mill and Vibrating Screen in operation at Carolina Solite Corporation Plant, Aquadale, N. C.



New plant under construction for Carolina Solite Corporation at Aquadale, N. C., showing rotary Kilns from firing end.

A view of the overall Solite operation at Bremo Bluff, Virginia —the largest plant of its kind in the world producing a controlled lightweight aggregate.

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MANUFACTURING & ENGINEERING CORPORATION

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posals "under preliminary study," which would be the basis for the new round of expansion. Among the firms involved; Kennecott Copper, New Jersey Zinc, Anaconda Copper, Eagle-Picher, Monsanto Chemical, Kaiser Aluminum, National Distillers Products, Glidden Chemical.

For the most part, the new contracts will involve a Government purchase commitment and an agreement to pay unamortized plant costs in case of contract cancellation.

Stockpile Program

STOCKPILING was one of the few Government programs that escaped a cut in the Administration's revamped spending budget for fiscal 1955. The revised budget issued last month calls for $1.6-billion less spending than the initial budget submitted to and approved by Congress earlier this year. Most of the reduction will come out of direct military expenditures.

Stockpile spending will total $900-million—at least twice the original schedule for the year and $250-million more than last year's expenditures. The increase stems from the Administration's accelerated stockpile policy—heavy buying of lead and zinc, faster deliveries of aluminum, nickel, molybdenum, and tungsten under long-standing floor-price contracts. To finance the increase, Congress added $380-million to stockpile funds still on the books.

First Columbium-Tantalum Mine

THE NATION'S first columbium-tantalum mine will be brought into production under a contract now being negotiated between GSA and Baker Bros., Boise, Idaho. The agreement being worked up is a five-year, floor-price purchase contract covering more than 1-million lb of combined pentoxide.

The U. S. now produces less than 1% of its columbium-tantalum requirements, wholly as a byproduct of bauxite, pegmatite, and other minerals. According to Baker Bros.' claim, the Idaho mine could produce enough metal to meet almost 40% of domestic needs. Known placer deposits of columbium-tantalum in Idaho are estimated to contain 10-million lb of metal.

Uranium Market Forecast

JESSE C. JOHNSON, director, Raw Materials Division, Atomic Energy Commission, foresees a possible world commercial market for uranium by 1980 of 14,000 tons.

This prediction, Johnson said, is based on AEC studies of power requirements. As early as 1965, nuclear power may be making a significant contribution to industrial power demands, he stated.

Johnson disclosed that AEC studies indicated that nuclear power will be competitive within 10 years, at least in high cost power areas. He envisaged that United States nuclear power capacity may be 12-million kw by 1970, 42-million kw by 1980 and 100-million by 1990.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

GOVERNMENT LAUNCHES RED UNION CRACKDOWN: Armed with a dozen new anti-Communist laws passed by the 83rd Congress, federal officials are moving against unions suspected of being run by Communists. The FBI is collecting evidence for the Attorney General to prosecute the suspected unions in the new Red sweep-up.

HERE ARE SOME OF THE KEY LAWS:

- **Communist Control Act of 1954.** This is aimed at the Communist-infiltrated labor union. It authorized the Attorney General to prosecute the Red-dominated union before the Subversive Activities Control Board. If the Board finds a union guilty, it is barred from bargaining or representing its members in any relations with management. This means, in effect, to destroy it.
- **Immunity Bill.** Witnesses testifying on subversion or espionage before Congressional Committees or the Courts may be granted immunity if they would otherwise invoke the Fifth Amendment. This will weed out the individual Communist member of a union.
- **New Penalties.** Sabotage in peacetime is made a capital offense; pensions are denied proven subversive government workers.

NEW LAWS SPELL TROUBLE FOR MINE-MILL: Although the Attorney General isn't saying so publicly, one of the first unions to be charged will be the Mine-Mill and Smelter Workers. Government agencies have already built up a backlog of evidence of alleged left-wing policies and control of the Mine union.

Should Mine-Mill be convicted before the Subversive Board, the Administration would move quickly to bar it from bargaining with mine management. However, don't expect immediate results. The law grants the unions court review of Board decisions.

Government security experts are hoping that a federal label of "Communist Infiltrated" will lead union members to throw out their leaders, before the law can take effect. But this may be an idle wish. Mine-Mill leaders were branded as party followers by the CIO when it expelled the Mine Union five years ago, but the Union is still thriving.

If there's any sign of defection in MMSW ranks, these unions will be ready to move in. One new regulation permits a local to vote out its leadership and join a rival union if 20% of the members petition for a representation election. But they must cite Communist control as the reason.

MINE-MILL FIGHTS NLRB: Acting under the admittedly ineffective anti-Communist provisions of Taft-Hartley, the National Labor Relations Board is still trying to move against Mine-Mill.

Past efforts have been stalled in the courts. In a new move, an NLRB trial examiner holds that Mine-Mill Secretary-Treasurer Maurice Travis has admitted he filed a false non-Communist affidavit in 1949. He also says—and this is the key—that the union membership was aware that Travis lied under oath.

The Federal Courts have indicated that the NLRB can withdraw Mine-Mill's bargaining rights provided its members were aware of Communist affiliations of its officers. If the NLRB upholds the examiner's findings, it will try again to take legal action.

Mine-Mill is fighting back. Its leaders claim Travis did, in fact, resign from the Communist Party to file the oath—that he did not publicly admit to union members he had filed a false oath and still believed in the Communist Party and its principles.

MINE UNION GIRDS FOR NOVEMBER: Although under attack in Washington, Mine-Mill officials still carry weight in the political arena. Particularly active in their Montana stronghold, these officials are teaming with other labor forces to push the election of Sen. James E. Murray. Murray forces claim the Democratic Senator is a shoo-in and Mine-Mill support is welcomed—as long as it remains a legal union.

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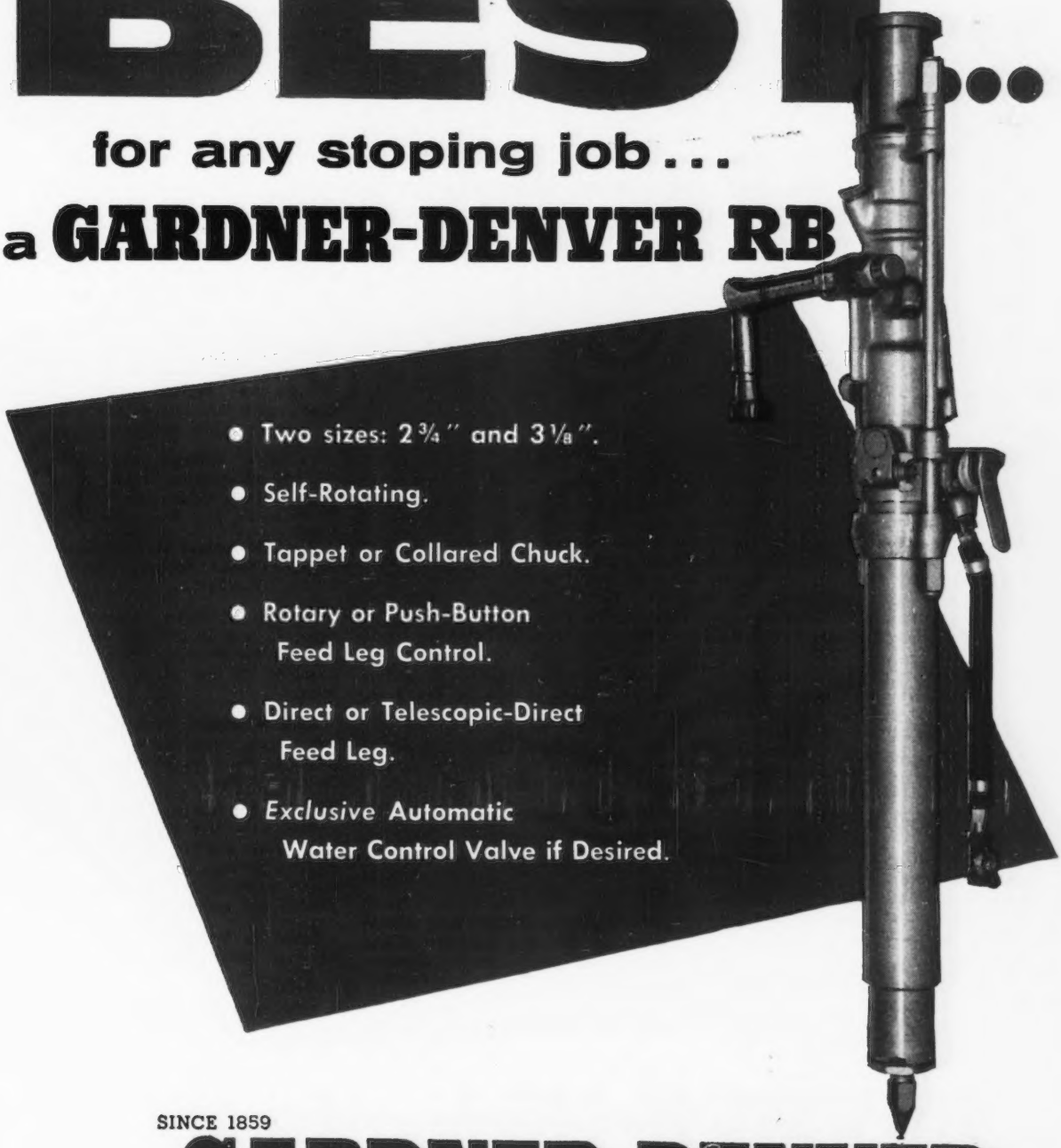

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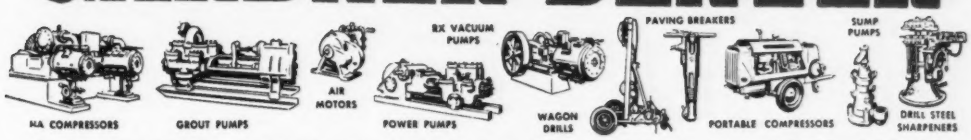

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PERSONAL NEWS

Emerson I. Brown (standing) was honored at a luncheon at the Iate Clube do Rio de Janiero recently for his ten years continuous service as minerals attaché of the American embassy in Rio by members of the Departmento Nacional da Producao Mineral. In attendance were **Dr. Avelino de Oliveira,** director-general, Brazilian Dept. of Mines (not shown); **Mrs. Robert P. Terrill,** wife of the embassy's economic counsel (at Mr. Brown's left); **Dr. Alvaro Abreu,** vice director of Brazil's National Coal Plan; **Dr. Miranda,** director DNPM laboratories; **Dr. Llewelyn Ivor Price,** paleontologist, Dept. of Mines (far right); and **Dr. Mario Pinto,** former director general, DNPM (foreground).

Col. George Cole, of Winnipeg, has been appointed by the Canadian government to study problems of the placer and quartz industry in the Yukon. It is reported that Col. Cole's recommendations will be an influence in the government decision regarding a revision in the Mining Act for or against post staking.

Thor H. Kiilsgard, geologist at the USGS Spokane office, has been promoted to staff assistant to the chief of the agency's mineral deposits branch at Washington, D.C.

J. S. Hay has succeeded **A. J. Cundill** as president of the Association of Mine Managers.

J. M. B. Gibbons, British mica expert, has been touring the Australian mica deposits in the Central Australian desert in his capacity as advisor to the Australian government.

M. T. Smith, mining engineer, has been promoted to mine superintendent in the Florida Phosphate department of International Minerals and Chemical Corp. He succeeds **I. S. Tillotson,** new property superintendent.

Neilsen B. O'Rear, information officer for USBM for the past 12 years, is now public information officer for the AEC at Grand Junction, Colo.

Richard I. Salberg has resigned as mine superintendent of MacIntyre Development of National Lead Co., and is now with Marcona Mining, San Juan, Peru.

John T. Sherman has been named head of the metals process section, Chemical Construction Corp.

Gifford V. Leece, former vice president and sales manager, has been appointed president of Gardner-Denver Co. and **Benjamin C. Essic** has been elected executive vice president.

Alvin J. Thuli, Jr., has been named assistant to the chief engineer of the newly-formed western mining divisions of Kennecott Copper Co., located at Salt Lake City.

Prof. E. C. R. Spooner, of the mining and metallurgy department, University of Adelaide, Australia, is technical adviser to the Government of Ceylon.

Dr. David I. Sinizer, Bedford, Mass., has joined the metallurgical research department of the National Research Corp.

Ira B. Joralemon and **Peter Joralemon** have announced their association as consulting mining engineers and geologists, with offices in San Francisco.

B. J. Kochanowsky, consulting engineer and member of the faculty of the college of mining of Penn State University, is now on a three months trip to Europe as consultant to the Krupp Co.

David W. Morgan, vice president of Westinghouse Electric Corp., has been nominated as the next president of the American Society of Mechanical Engineers.

Hubert O. De Beck is now engaged as consulting mining engineer with the Baroid Sales division of the National Lead Co. Mr. De Beck recently completed a lengthy term as consultant to the USBM.

Stanley V. Burr has been appointed president and managing director of Burrex Mines, Ltd., British Columbia.

Harley A. Coy, general superintendent of Tennessee operations of American Zinc Company of Tennessee, has been named vice president of the company. Also promoted, according to company officials, was **William Black,** assistant general superintendent, who is now manager of Tennessee operations.

Frank W. Millsaps, mill superintendent, Saudi Arabian Mining Syndicate, has left that organization to join National Lead Co. at Baxter Springs, Kans.

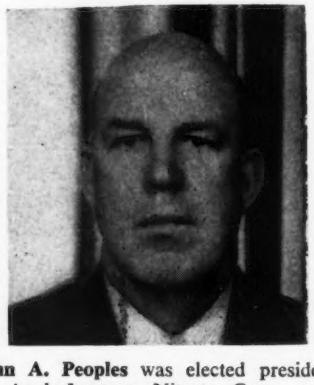
F. V. Hendershot has been transferred to the Ciudad Bolivar operations of Orinoco Mining Co.

Norman H. Fisher, Australian geologist, is now in Bolivia, where he is assisting the Bolivian Mining Corp. in a survey of that nation's mineral resources.

John R. Bogert, formerly of Kennecott Copper Corp., Lima, Peru, is now employed as mining geologist with Cerro de Pasco Corp.

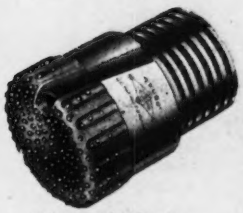
Cooper H. Wayman, research petrographer with U.S. Steel at Pittsburgh, Pa., has left that firm to join the Massachusetts Institute of Technology as research assistant in the department of geology and geophysics.

Lloyd A. Yesberger, Duluth, Minn., has been named supervisor of the Du-

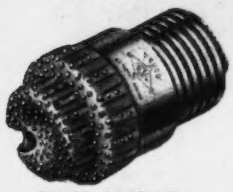


John A. Peoples was elected president of Anglo-Lautaro Nitrate Corp., succeeding Horace R. Graham, who is retiring.

TRUCO CORING BIT



TRUCO CONCAVE BLAST HOLE BIT

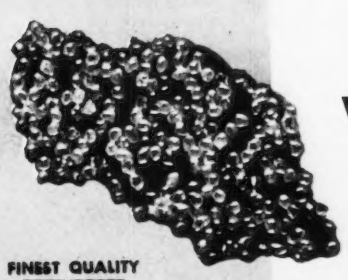


TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS

TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

"Bloomin Idol made o' mud— wot they called the Great Gawd Budd"

—KIPLING

The two French soldiers crouched and watched the white little beam of Indian sunlight creep into the eye of the great gilded image across the shadowy chamber. Suddenly, the eye blazed and flashed with brilliant, jewelled fires.

"Diamants!" they whispered, and rushed over and clambered up to the great face. A few moments later they ran out into the turmoil and gunfire in the streets and fled with the rest of the French soldiery, retreating before Captain Clive's victorious Sepoys.

A diamond as big as a walnut and weighing 200 carats isn't the easiest thing to trade, but, eventually, it reached an Armenian dealer who sold it to the Russian Count Orloff for $560,000. The Count diplomatically presented it to the Empress Catherine, who was so pleased that she gave him a half-million dollar grant and another title.

After 200 years, the Orloff Diamond is still one of the world's great jewels. Probably it came from the fabled diamond fields of Golconda which supplied ancient Indian craftsmen with diamonds for their metal-working tools.

And, today, as then, diamonds are still the world's greatest cutting element and in Truco Diamond Bits they provide drillers with the irresistible cutting power for which Trucos are famous—swift, accurate, thrifty, dependable penetration in any formation. Naturally, this cuts rig time and lowers footage costs. May we send you the Truco Drill Bit Catalog?

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Victor B. Coster, former president of Overseas Raw Materials Corp., is now with E. A. Godoy & Co., Inc., representing mining companies in the U.S. and other nations.

luth engineering department of Reserve Mining Co. In another company promotion, **John Ott** was made superintendent of power at Silver Bay.

Rex St. Clair, formerly operating on the Mesabi Range for Hercules Powder Co. and later export manager in New York City, has retired after 35 years' service.

On a recent trip to Australia, **Roger W. Straus,** chairman of the board, AS&R, **R. F. Goodwin,** vice president, and **D. J. Pope,** assistant to the president, visited company properties at Mount Isa Mines and Bowen Consolidated Coal Co.

Donald G. Ashe has joined the engineering staff of the Allen-Sherman-Hoff Pump Co. at Wynnewood, Pa. Mr. Ashe will specialize in the application of sand pumps in mining. He was formerly with Cananea Consolidated Copper Co., Sonora, Mex.

J. M. Girvan, formerly mine superintendent for Broulan Reef Mines, has joined Compania Minera Aguilar, Jujuy, Argentina, a subsidiary of St. Joseph Lead Co.

James E. Atkinson, mining engineer and geologist of San Francisco, is now consultant for the new columbite-tantalite project of Morabisi Mining Co., Ltd., Georgetown, British Guiana.

Four new appointments to the AEC Grand Junction operations office exploration division have been announced by **Sheldon P. Wimpfen,** manager. New staff members are: **David D. Baker,** staff engineer, formerly of Utah Construction Co.; **Otto D. Rohlfs, Jr.,** administrative geologist, who recently returned to the AEC after a stint in the Coast Guard; and **Ward Carithers,** geologist, who will be in charge of the division's geologic activities in district 5. New district 6 geologist, recently named, is **John W. Gabelman.**

W. Page Morris has been named vice president and assistant general manager of Duval Sulphur & Potash Co., and was transferred to the firm's headquarters in Houston, Tex. **George E. Atwood,** former resident manager of the company's potash mine at Carlsbad, N.M., succeeded Mr. Morris and was in turn succeeded by **Jerry E. Tong,** former mine superintendent.

Robert W. Kliebenstein has been transferred to Calumet & Hecla's uranium project at Albuquerque, N.M., where he is working as engineer.

Albert Hopkins, mining geologist and engineer, has opened a consulting practice at 1320-1730 Bank of Commerce Building, Toronto 1, Canada.

K. W. B. Iten, former geologist-in-charge, Cerro de Pasco geological department, is now in the Philippines, with Benguet Consolidated Mining Co., Balatoc.

J. N. Collison, who completed his B.S. training in mining engineering at Texas Western College in May, is now a mining-geologist with Moab Drilling Co., Moab, Utah.

H. L. Talbot, consulting metallurgical engineer, has opened an office at room 331, 84 State St., Boston 9, Mass., where he will specialize in extraction and refining of base metals.

Luis A. Nogales, general manager of the ex-Aramayo mines and Bolivian Tin & Tungsten Corp., has been promoted to general production superintendent of Corporacion Minera de Bolivia.

Dr. Jacob Gair and family, of Iron River, Mich., have left for Minas Gerais, Belo Horizonte, Brazil, where he has been assigned by USGS to engage in mineral mapping for iron ore occurrence.

Philip D. Pearson and family have moved from Iron River, Mich., to Atikokan, Ont., where Mr. Pearson will serve as manager of Caland Ore Co. Mr. Pearson was formerly superintendent of Inland Steel's iron mines on the Menominee Range.

William E. Horst recently joined Foote Mineral Co. research and development as a metallurgical engineer.

Robert Morris, formerly chief analyst for U. S. Vanadium Co., at Uravan, Colo., is in charge of the minerals assaying laboratory which opened in Grand Junction recently.

Recently appointed to the uranium division of J. R. Simplot Co. are **Philip T. Peterson,** manager; **Don Ferguson,** staff engineer; and **S. A. Robinson,** exploration engineer.

OBITUARIES

Captain Harry Scarffe, 65, former superintendent of the Spies mine of the Cleveland-Cliffs Iron Co., died in Ishpeming, Mich., after a long illness.

John H. Sellen, Sr., civil engineer of Seattle, died there Aug. 19. Mr. Sellen had been associated with Kennecott Copper Corp. in Alaska until 1924, and was later associated with his son's firm, the John H. Sellen Construction Co.

John E. Kelley, 58, well known consulting mining engineer, died suddenly in Washington, D.C. of a heart attack on June 18. Mr. Kelley worked in Central America, Venezuela and Spain and was recently awarded the Spanish Grand Cross de Isabel la Católica for his work in the latter country.

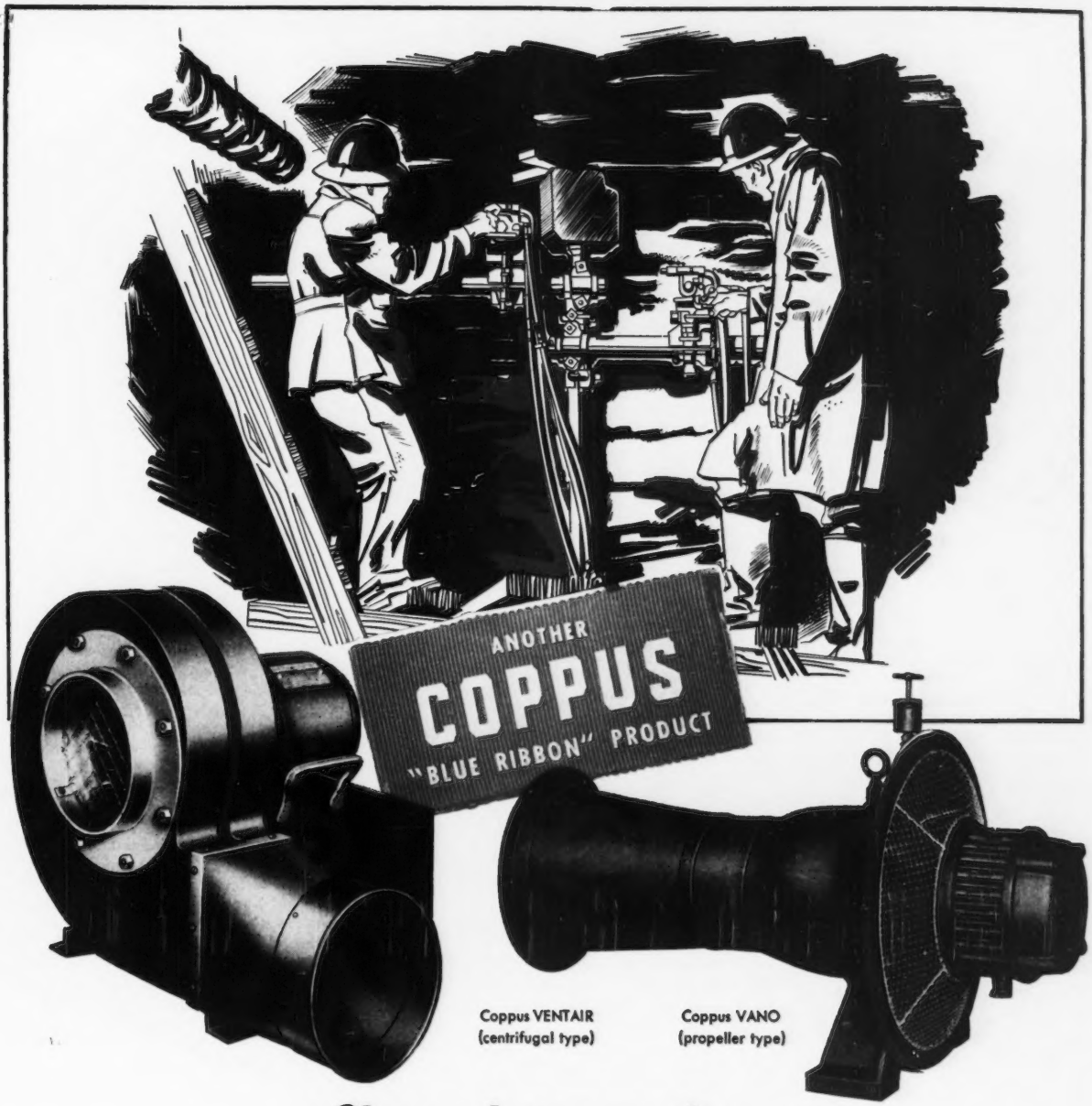
Dr. Clive E. Cairnes, 61, who made important contributions to the development of mineral resources in British Columbia during his 35 years with the Geological Survey of Canada, died while visiting friends in Vancouver. His home was in Ottawa.

Richard Herb Reese, 75, former president of the New Mexico Mines at Socorro, who retired from a teaching career in 1946, was fatally injured in an auto accident at Socorro. Mrs. Reese was seriously injured.

Walter Cross, 54, who conducted potash prospecting and testing operations in New Mexico and was with the Continental Potash Co., died recently at his home in Kansas City, Mo.

Dr. Paul E. Imbault, geologist for Kennco Explorations (Canada) Ltd., and a companion, **Donat Desjardins,** of Havre St. Pierre, and also employed by Kennco, were drowned in the Bersimis river on June 26.

Stanley Barber, senior executive and manager of the Overseas Metal & Ore Corp., and well known in international metal and ore trading centers, died suddenly at New York City.



Coppus VENTAIR (centrifugal type)

Coppus VANO (propeller type)

Choose between them and get 30% to 100% more air

Coppus Blowers are designed for two different types of mine ventilation requirements: the centrifugal Coppus VENTAIR is for long pipe lines; the propeller-type Coppus VANO for shorter lines . . . the correct selection will give you from ⅓ more to twice as much air — for a given power consumption — than an ordinary all-purpose fan.

Available for either compressed air or electric motor drive, both can be used as blowers or exhausters and are obtainable in capacities up to 90,000 CFM.

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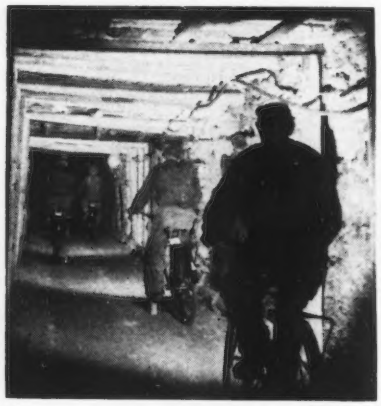
Letters (*Continued from p 4*)

od and having the air and water lines within the column.

BURTON J. WESTMAN
Consulting Mining Geologist
Aloha, Ore.



Daisy, Daisy

SIR:

A box of cigars against a bottle of whiskey that no U.S. mining man of 71 ever rode a bicycle underground in a coal mine 3 mi round trip to the face like I did last summer. Any takers?

At the Nyvang mine (in southern Sweden) I went underground and the superintendent asked me if I could ride a bicycle. I said yes, although I had not been on one for about 45 years. About 200 ft from the bottom were 50 bikes in a rack at the side of the entry. The superintendent pulled one out and said, "That's yours. We're going to ride about a mile and a half to the face."

Forty-five years is a long time. I fell once . . . and wobbled from rib to rib, but I was successful although not so nimble.

(It seems that) several years ago one ingenious miner said, "Let's ride our bicycles to work down here. This is too far to walk." That was an operating idea for fair! They've been doing it ever since.

C. C. AUSTIN
Palo Alto, Calif.

Mining at Mojave

Ed: In the June issue of E&MJ, we published a letter from G. Cleveland Taylor concerning "Seldom Seen Slim." Another portion of the letter follows.

"The Rand district has been quite unusual in that three separate and important mining booms have occurred within a radius of only a few miles; each having a different mineral as the major product.

"The discovery of the Yellow Aster mine at Randsburg, in the middle nineties, brought considerable activity in gold mining and it continued for a number of years. Numerous properties were operated, but the largest production (probably $10-million) came from Yellow Aster.

The 'heavy spar' (which caused so much trouble in the concentrating of gold ores) in 1903 was identified as scheelite. when we entered the first world war . . . the price of tungsten skyrocketed and the second boom occurred. The major operations were in the vicinity of Atolia and the richest and most intensively mined section was called the 'spud patch.' At the close of the war . . . tungsten dropped again and by the end of 1918 most of the mines had closed.

"On April 12, 1919, Jack Nosser and Hamp Williams discovered the Kelly Mines bonanza and set off the (famous) silver boom. The discovery was unique to an extreme as, years before, a shallow prospect hole had been sunk in very rich ore with high-grade thrown out into a dump. It is probable that prospectors, back in the days of gold activity, dug the hole and not recognizing the silver, went away discouraged (after) actually 'removing the lid' from a rich bonanza. . . . (which) lay for years in plain sight, within a stone's throw of automobile roads; power lines; a railroad; and all in an active mining district."

HELL

They're Back Again

WELCOME OLD DRIPPERS

Randsburg Water Company

Auld Acquaintance

SIR:

(The enclosed is a page from the program from a celebration) at Randsburg, Calif. Many old timers gathered for the show and the Randsburg Water Co. inserted the ad, which gave us all a laugh.

The explanation: Water . . . was, and still is, one cent a gallon (there). An observant housewife discovered that if one cracked the faucet just enough to permit a drip of 70 to 80 drops per minute, the water meter would not register. (Soon) every house in Randsburg had some receptacle under the faucet and into it ran the drip, drip, drip. Each drop made a nice musical tinkle.

The water company said about 18% more water was running through the master meter than through the combined household meters, so the Randsburg wives were about as adept at highgrading as their husbands. Hell, they're back again!

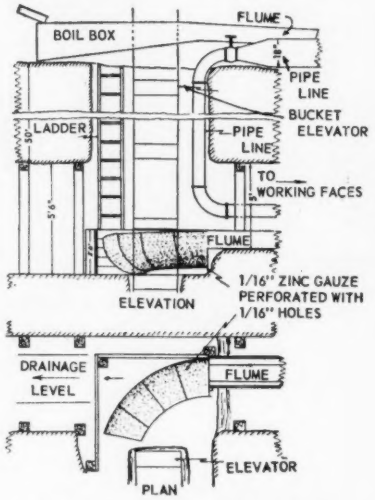
ATHA A. RICHIE
Rialto, Calif.

Hydraulic Mining

SIR:

In the January 1952 issue of *E&MJ* there appeared the article (Hydraulic Pump Hoists Ore in Full-Scale Trial Run," by Percy S. Gardner, Jr., p 94).

I am an inspector of coal mines in sole charge of a district where hydraulic mining is widely favored and used because it provides greater safety and larger outputs with fewer men. Local geology and a plentiful supply of water encourage this form of mining and it is being installed wherever practicable.



As I appreciated the value of the system, I wrote a paper on one mine where it is applied, and as Mr. Gardner and I had something in common, I sent him a copy of the paper. He replied that he proposed incorporating it with his scheme for working a gilsonite mine in Utah where the material is to be raised 1000 ft by hydraulic hoist.

L. COOK
Westport, South Island
New Zealand

Ed: As the drawing above indicates, Mr. Cook's method carries water to the face via a pipeline and the water then returns the ore via the flume to a sump where the continuous bucket elevator raises it to the surface. The title of Mr. Cook's paper is "Practical Application of Hydraulic Mining at Rahui Buller Coalfield," published by the University of Otago School of Mines and Metallurgy.

Tungsten Carbide Drilling

SIR:

We have observed the article (Progress in Tungsten Carbide Drilling In Germany—1932 to Date, *E&MJ*, July 1954, p 92) particularly . . . regarding . . . early developments of tungsten carbide for use with rock drilling stems.

We draw your attention to an article by Mr. Sandstrom in *Industria International 1953*, p 28 (published at Kungsholmstorg 1, Stockholm), in which it is stated that development of tungsten carbide in Sweden was parallel to that in Germany and was begun in Sweden in 1926 by the Swedish Arbit Works, now a subsidiary of Fagerstra Steel Works. It is also stated that Fagerstra launched its hard metal commercially in 1931 under the trade name of "Seco."

J. E. FRANCIS
Consolidated Pneumatic Tool Co. Ltd.
London, SW 6, England

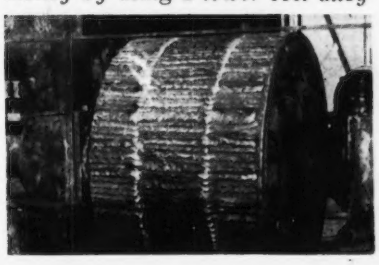
These rolls, hard-faced when new with Coated Tube Stoodite, have been in operation 3 months, crushing extremely hard river rock. When hard-facing is re-applied beads are slightly separated, areas between being filled on successive applications.

IMPROVING CRUSHER EFFICIENCY with Stoody Hard-Facing

All crusher rolls lose sizing efficiency because of uneven wear. As roll centers become worn, a gap develops between them, permitting oversize material to pass through. With continued wear, crusher adjustments cannot compensate and efficiency is lost.

BALANCING WEAR RESISTANCE

The answer is use of two Stoody Hard-Facing Alloys of dissimilar wear resistance. Roll centers are protected with Coated Tube Stoodite; outside areas with Stoody 21. *This procedure concentrates extra wear resistance where most needed, at the same time saves money by using a lower cost alloy on edges!* Net result is balanced wear, flatter roll surfaces and more uniform sizing of material over life of the rolls.



HARD-FACING KINKS

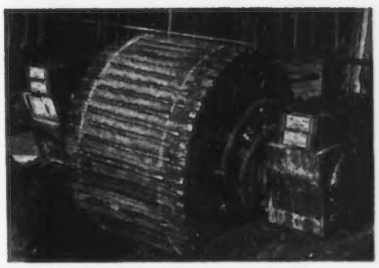
Always skip-weld to avoid overheating. New hard-facing beads can be applied alternately between former deposits.

After repeated welding, manganese rolls may deteriorate from application of heat, causing hard metal to spall. This can be prevented by applying a layer of Stoody Nickel or Moly-Manganese to the parent metal after 3 or 4 hard-facing applications. If crusher rolls are carbon steel, use Stoody Build-Up.

IMPROVING GRIP

A better grip is possible if one roll is hard-faced with a series of spaced stringers, forming corrugations. Follow the same bi-metal technique for balancing wear.

By repeating hard-metal applications, as required, three times normal life is not unusual for crusher rolls. This and other crusher hard-facing techniques are described in the Stoody Hard-Facing Guidebook.



This illustration shows method of spacing stringer beads on one roll to improve grip. Coated Tube Stoodite is applied in center area, Stoody 21 on outer edges.

Ask your Stoody dealer for a copy (See the yellow pages of your phone book) or write direct!

STOODY COMPANY
Whittier, California

The Reader AUDITED PAID ABC CIRCULATION *His Mark*

THE ABC SYMBOL, which appears at the head of this page, is your brand—the reader's brand—on this magazine. It stands for Audit Bureau of Circulations. It means that this magazine will stay in business only so long as it continues to serve its readers to their satisfaction.

That Bureau—known for short as ABC—is a voluntary, nonprofit, cooperative association founded in 1914 by a group of publishers, advertisers and advertising agencies who wanted to establish and maintain higher standards of publishing practices than then prevailed. Its primary and specific purpose was to set up yardsticks to appraise circulation values and to verify the claims of publishers as to their circulations. For the buyer of advertising space this provides an effective means to take some of the guesswork out of buying and to reconcile the conflicting claims of competing publishers. BUSINESS WEEK magazine has aptly described ABC as "the publisher's conscience—and cop."

BUT IN DOING that job, ABC performs another function of high importance to the readers of ABC member publications. It provides a constant pressure on the publishers to keep alive in their staffs a sense of primary responsibility to their readers. That is because the most simple and direct method of making a publication responsible to its readers is to place upon it a purchase price, whether by subscription or newsstand purchase. The right to purchase or to refrain from purchasing a publication gives to the reader and to no one else the power to pass effective judgment on the publisher's success in serving the reading public. Each paid publication will grow or languish, will prosper or fail, in proportion as it wins or loses the following of thousands or millions of readers. The readers, by their patronage, record their judgments as to whether the publisher and his publication are measuring up to their responsibility to them.

And that is where the ABC comes into the reader's picture. The newspaper or magazine that carries the ABC symbol on its masthead must in the first place be a paid circulation publication. Moreover, it must conform to the high standards set up by the Bureau as to terms of payment and accounting methods. And again it must open all of its books to the auditors of the Bureau on demand.

SINCE THE INFORMATION thus determined by thorough and impartial audit is periodically made public through the ABC statements and audit reports, it is constantly available to and universally used by advertisers who are considering the purchase of space in an ABC publication. These reports show the circulation trend, as verified and certified by ABC, and thus put the advertisers in a position to know whether or not the publisher is rendering satisfactory service to his readers.

Thus the publisher who submits his publication to the supervision and discipline of ABC affirms in the strongest possible manner that he recognizes his primary obligation is to his readers and that he owes his standing to a voluntary demand by those readers. It follows that the editors of ABC publications must be exceptionally alert to the desires of their readers and responsive to their needs, since any decline in circulation will soon show up in the ABC statements and audit reports.

THAT IS WHY we describe the ABC symbol as the reader's brand. It shows that a publication must be primarily responsive to him and that he holds in his own hands its success or failure. And that ABC symbol is not only a constant reminder to him of that fact, but also an equally constant reminder to all concerned that the reader's willingness to pay for the ABC publication is the acid test of its value to him and to the advertiser.

McGraw-Hill Publishing Company, Inc.

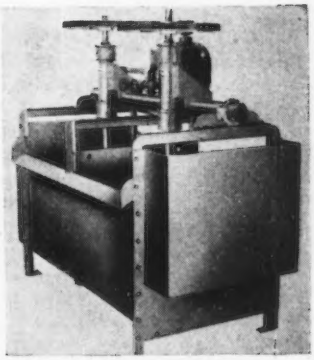
AGITAIR IS THERE!

At mills all over the world

This picture of mineral laden froth is typical of AGITAIR operations all over the world. And because results are always as good or better than standards set by laboratory and pilot plant procedure, AGITAIR has come to be recognized as the leader in its field. AGITAIR is the versatile machine that adapts to the specific job, serves dependably and economically and stands up under long, hard use. AGITAIR has many applications in the metal and non-metallic industries.

We hope you had an opportunity to see the Galigher line of equipment at the recent American Mining Congress show. We invite your inquiry about any of the Galigher products.

Manufacturers of commercial and laboratory AGITAIR, Vacseal Pumps, Acid-proof Sump Pumps, Laboratory Ball Mills, Geary-Jennings Sampler, Geary Reagent Feeder and Laboratory Pressure Filters.



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Agents In All Principal Foreign Mining Districts

THIS MONTH IN MINING

NEW MILL looms above the town of Asbestos. Dry rock storage building which can shelter 60,000 tons of ore may be seen in the left foreground. Behind this storage building are old milling facilities which the new mill will replace.

World's Largest Asbestos Mill Opened By Johns-Manville In Quebec

WORLD'S LARGEST asbestos mill—which will serve the world's largest asbestos mine—was formally opened by Johns-Manville Corp. Sept. 30 at Asbestos, Que.

When the new mill attains full capacity early in 1956, it will process more than one-third of the Free World's supply of asbestos fiber. At present, the mill building is only half complete and only about 25% of the machinery is installed and ready for operation. Once completed, the mill will boast an annual capacity of 625,000 tons of fiber and provide employment for 600 men.

Gradually, the new mill will supplant operations at several smaller mills which have now become obsolete. Embracing all modern aspects of asbestos milling, it will produce cleaner fibers, more efficiently.

Adjacent to the famous J-M Jeffrey Mine, long recognized as the world's largest asbestos mine, the new mill will draw on ore reserves (chrysotile in serpentine) for more than 100 yr of operation at the present rate of production. In 1953, the several mills processing Jeffrey ore produced 481,533 tons of asbestos fibre, 56% of all the fiber produced in Canada.

Company officials say that the new mill is expected to provide the safest and healthiest working conditions of any fiber mill in Canada or the United States.

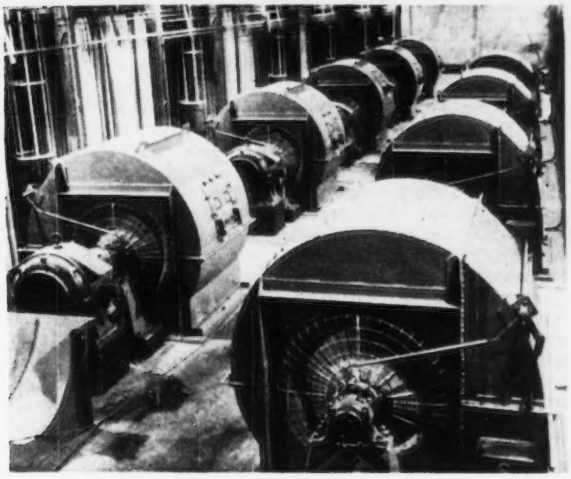
There are 4000 separate dust enclosures, utilizing 4 mi of piping and 12 mi of control wiring in the dust control system. It takes 30 acres of cloth to provide bags used in filtering dust as the ore is milled. When in full operation, the new mill will have air-handling equipment capable of purifying 2.5-million cfm.

In addition, there are 5000 separate safety guards on the milling equipment and more than 4600 fluorescent lighting units. To move the ore through the mill in its various stages, there are 5.2 mi of rubber belting, 10 mi of rock and fiber chutes and 7 mi of fiber aspiration piping. The mill's power plant has 15,000 connected hp.

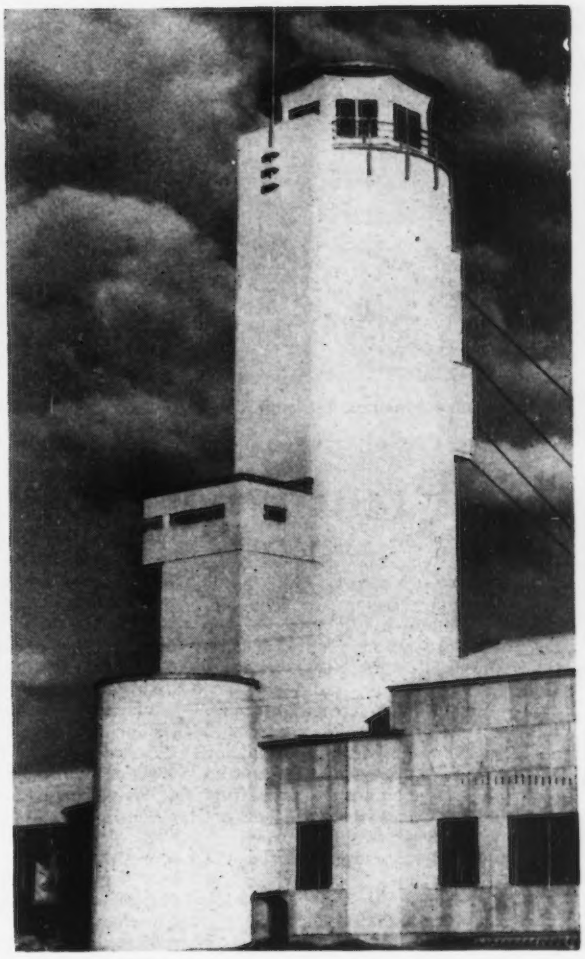
Housing this is a 14-story steel and concrete building sheathed with Transite, an asbestos-cement product manufactured by Johns-Manville. When complete, the mill building will be 432 ft long, 330 ft wide and 195 ft high. The 14 floors will cover 972,000 sq ft, or 22½ acres. When construction began in the fall of 1952, it was necessary to excavate 300,000 cu yd of earth for the building site.

At Asbestos, Karl V. Lindell is general manager, Asbestos Fiber Division, J-M Corp., in charge of mining, milling and marketing; J. O. Eby is mine manager; H. F. Janson is mill superintendent, and Robert W. Winson is acting mill superintendent.

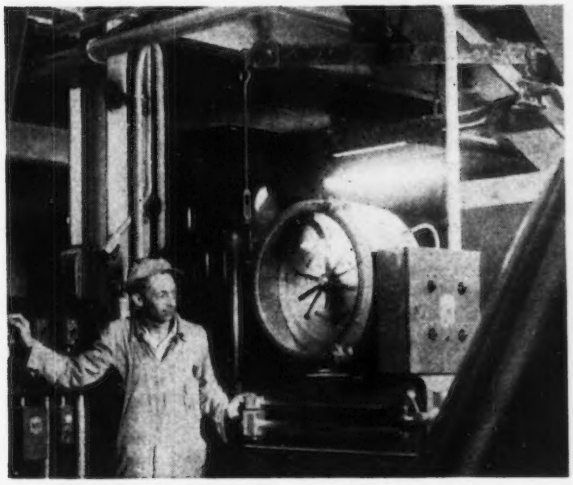
FAMOUS JEFFERY open pit mine and plant which under current operations accounts for only 28% of production.



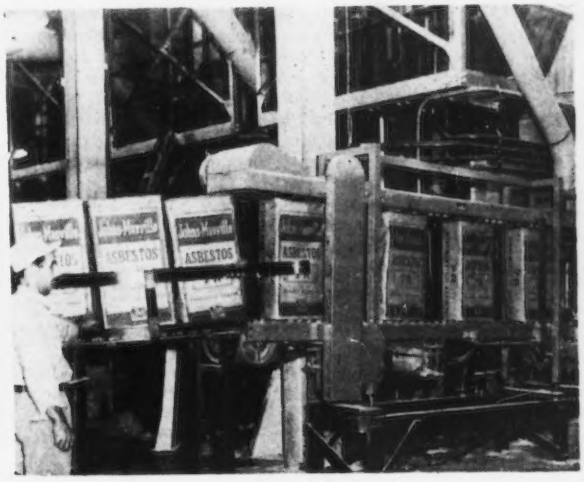
EACH FAN boasts 123,000 cfm capacity and is used for aspiration of asbestos fiber from ore and for dust control.



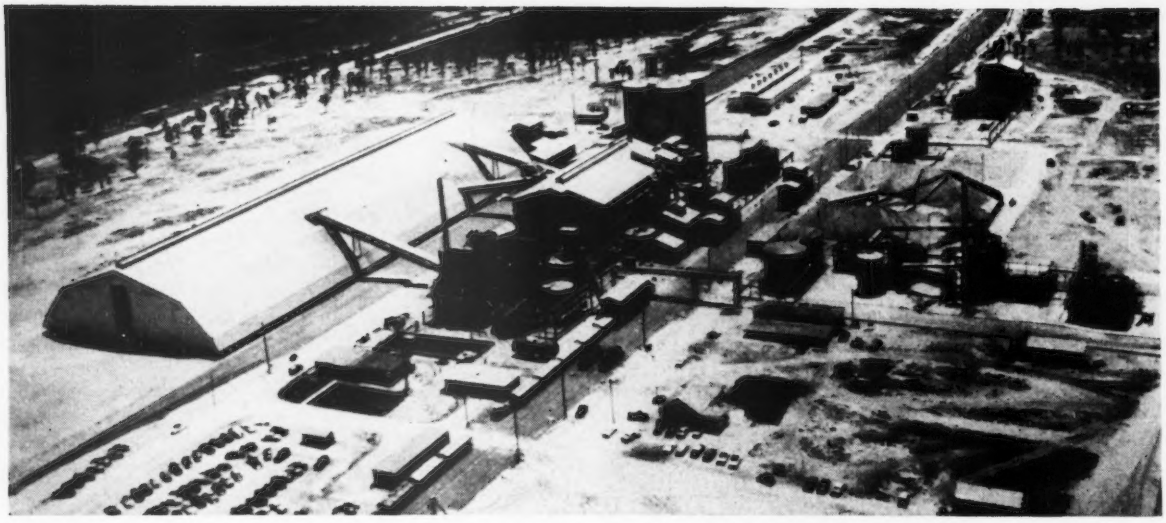
MINE SHAFT head frame towers above one of two underground mine shafts. Block-caving mining methods are used.



AUTOMATIC BATCHING equipment is capable of mixing as many as five different grades of fiber in varying amounts.



BAG SEALING machine automatically seals packages of 100-lb of compressed blocks of asbestos fiber for shipment.



International Minerals & Chemical Corp.'s Bonnie Plant, first to recover uranium from phosphate commercially in Florida.

By-Product Uranium Output Increases

U. S. PHOSPHATE PRODUCERS in Florida and the Western region are giving increased attention to the AEC-backed study on by-product uranium production from phosphorite and black shale deposits.

While the uranium content of phosphate rock usually only ranges from .2 to .4 lb per ton, the possibility of adding to the Free World's supply of the valuable oxide and gaining some profit from a by-product makes the AEC project attractive to phosphate producers.

The program has moved well beyond the development and research stage and four major companies are now taking active part in uranium production.

International Minerals and Chemical Corp.'s Bonnie Phosphate Chemical plant, near Bartow, Fla., is in the shakedown phase of by-product uranium production. IMCC has been operating a small pilot plant for about two years, the first facility to recover uranium from phosphate on a commercial scale in Florida. Since 1950 the company has conducted studies on geology, exploration and process development in cooperation with AEC to develop commercial phosphate rock and "leached zone" material as economic sources of U_3O_8.

"Leached zone" material is a low-grade aluminum phosphate which is now rejected by most producers and discarded as waste. It overlies the commercial deposits, known as matrix, which contain the commercial phosphate rock used by the fertilizer industry. Use of the leached zone material offers Florida producers the recovery of raw material for phosphate, alumina and fluorine as well as uranium.

Virginia-Carolina Chemical Corp. has recently completed construction of a by-product unit at its new triple superphosphate plant at Nichols, Fla. Highest concentration of uranium-containing phosphate so far found is in deposits of the Pliocene Bone Valley formation in Florida and the Permian Phosphoria formation in Wyoming, Montana, Idaho, Colorado and Utah. Other areas in Florida are now being explored.

Blockson Chemical Co., a producer of sodium phosphate chemicals in Joliet, Ill., has been in full production since 1952, obtaining uranium as a by-product of the production of the chemicals.

Texas City Chemicals, Inc., Texas City, which reached full production early this year, recovers uranium concentrates as a by-product of feed grade dicalcium phosphate and fertilizer-grade dicalcium phosphate. Both Texas City and Blockson processed rock which was mined and concentrated in Florida.

Other operating companies in Florida and the Western region are cooperating with AEC in pursuit of additional recovery with the addition of relatively small extraction units to their phosphate fertilizer operations. Tennessee Valley Authority has a small pilot plant unit dedicated to study of the leached zone material and Virginia-Carolina is also experimenting in technology of the material, which represents an opportunity to develop a new source of uranium from a former waste material.

Others cooperating with the Commission in long-range studies of the leached zone material are Aluminum Company of America, Texas City Chemicals, Blaw-Knox Co., and the General Chemical division of Allied Chemical and Dye Corp.

James A. Barr, Jr., assistant director of domestic production, division of Raw Materials of AEC, in a talk to the Phosphatic Fertilizers Industry Advisory Committee said, "The Commission's phosphate program encompasses all opportunities for economic recovery of uranium concentrates at acceptable prices." Noting Government interest in the leached zone material, Mr. Barr observed that it occurs in Florida as a weathered material, 2- to 25-ft thick, and had been, prior to the AEC study, discarded as waste.

"In Florida," he said, "both raw matrix . . . and raw aluminum phosphate material contain uranium in minor concentrations of .1 to .4 lb U_3O_8 per ton of material. More than 25-million tons of raw matrix were mined (in 1952), from which about 9-million tons of commercial phosphate rock and pebble concentrate were produced. An estimated 14-million tons of 'leached zone' material were moved and discarded as waste.

"The development of feasible process technology to encompass all available lowgrade possibilities will continue to cause furrowed brows for some time to come. However, the objectives are most worthy of consideration . . . since, in addition to new phosphatic fertilizers there are co-product and by-product possibilities . . .

"Process studies include the recovery of by-product uranium from industrial sources such as:

a. Wet process phosphoric acid
b. Phosphate chemicals from wet phosphoric acid
c. Triple superphosphate fertilizers
d. Nitric phosphate fertilizers
e. Normal superphosphate fertilizers
f. Electric furnace operations for elemental phosphorus."

AEC points out that development of domestic phosphate resources and by-product uranium is a definite contribution to national security. It is especially important, says the Commission, because millions of tons of phosphatic rock are produced annually and the life of U. S. deposits is estimated at better than 100 yr.

TRADITIONAL PINE TREE is placed atop the first load of iron ore concentrates shipped from Oliver Iron Mining Division's newly-opened Plummer mine and beneficiation plant near Taconite, Minn., by E. A. Friedman (left), general superintendent of the company's Canisteo District, and Wayne Beebe, mine superintendent. More than 2 yr of development and construction work was done before the first ore was produced. This is the sixth plant put into operation by U. S. Steel's Oliver division to conserve direct-shipping ores by use of low-grade materials. The new mine-plant will have a capacity of 1.2 million tons a year.

Union Carbide to Build $31.5-Million TiO_2 Plant

SIGNING OF A CONTRACT which calls for construction of a $31,500,000 plant designed to produce 7,500 tons of titanium metal annually was announced Sept. 15 by the General Services Administration. The project will be constructed by the Union Carbide & Carbon Corp., New York, which will act through its Electro Metallurgical Division.

The agreement provides that Electro Metallurgical will use its own funds for the design and construction of the facility. The plant is to be located at or near Ashtabula, Ohio, and is expected to be in operation within two years.

After attaining a rate of production of 500 tons a month, the Government has an option to buy 4,500 tons annually at the market price prevailing at time of delivery. In addition, the company has the right to deliver to the Government whatever production it cannot sell in the commercial market up to a maximum of 6,000 tons a year.

The agreement covers a five-year period from the time the plant starts producing on a commercial scale. However, upon one year's notice the Government may cancel the agreement by paying the company an amount equal to the unamortized cost of the plant.

Electro Metallurgical will use a sodium reduction method which it has pioneered in pilot and prototype stages for some time. This marks the first departure on a commercial scale of a method other than the well-known Kroll process.

In addition to an experimental-type agreement with Horizons Titanium Corp., and a lease with Western Pyromet Co., GSA said the new contract brings total planned U. S. titanium capacity to 22,500 tons a year.

Other metal contracts in effect are: DuPont, 2,700 tons annually; Titanium Metals Corporation of America, 3,600 tons; Cramet, Inc., 6,000 tons; and Dow Chemical Co. 1,800 tons. DuPont is also producing 900 tons a year which is not tied to a Government contract.

Mining Calendar

Rocky Mountain Region Industrial Minerals Conference, Oct 28-30, Newhouse Hotel, Salt Lake City.

Society of Exploration Geophysicists, 8th Annual Midwestern Meeting, Nov. 18-19, Adolphus Hotel, Dallas.

Colorado Mining Association, Annual Meeting, Feb. 3-5, Denver.

AIME, Annual Meeting, Feb. 14-17, Hotel Conrad Hilton, Chicago.

Ninth Western Metal Congress & Exposition, Mar. 28-April 1, Pan-Pacific Auditorium, Los Angeles.

News Highlights

Kenai Chrome Co. in Alaska was pleasantly surprised by an unexpected widening of an orebody. **Page 124.**

Quicksilver Mines Inc. in California plans a $50,000 expansion of its mill facilities. **Page 126.**

Minerals Engineering Co. plans immediate construction of a pilot plant in Grand Junction for testing a new step in uranium ore processing. **Page 128.**

A program of exploratory diamond drilling is underway at the Silver Mountain Lead Mines Co. property in Idaho's Hunter Mining District. **Page 135.**

A simple process known as timber-bundling has added much to underground mining efficiency at Pickands, Mather & Co.'s Newport Mine in Ironwood, Mich. **Page 141.**

The new iron ore carrier, the George M. Humphrey, has left drydock and is expected to enter service this season. **Page 144.**

Anaconda Aluminum Co.'s plant at Columbia Falls, Mont., now is slated to go on-stream next July. **Page 146.**

Newmont Mill at Goldfield in Nevada has been revamped and was scheduled to begin operation October 1. **Page 148.**

No. 2 furnace is to be fired up this fall at the Hanna Nickel Smelting Co.'s new plant at Riddle, Ore. **Page 150.**

Bethlehem Mines Corp. expects to make first shipments by year-end from its big open pit magnetite mine at Marmora, Ontario. **Page 158.**

Production plans have been changed for the West MacDonald property in the Noranda area of Quebec. **Page 164.**

The first blister copper is coming from the reorganized former property of Cia. Minera El Boleo, S. A., in Mexico. **Page 168.**

A new manganese deposit is being mined in Juyjuy Province, Argentina. **Page 171.**

Montan GMBH, a German firm, has offered to built an electrolytic copper refinery in Chile. **Page 172.**

Banco Minero del Peru is nearing completion of a flotation-type concentrator 14,000 ft above sea level. **Page 178.**

A process for titanium refining with metal calcium has been developed by the Japan Metallic Titanium Manufacturing Corp. of Tokyo. **Page 180.**

Kilembe Mines in Uganda has contracted for construction of copper and cobalt facilities. **Page 182.**

Foundations already have been laid and overhead steel construction is about to begin on a $300,000 mica mill near Santa Fe, N. M. **Page 186.**

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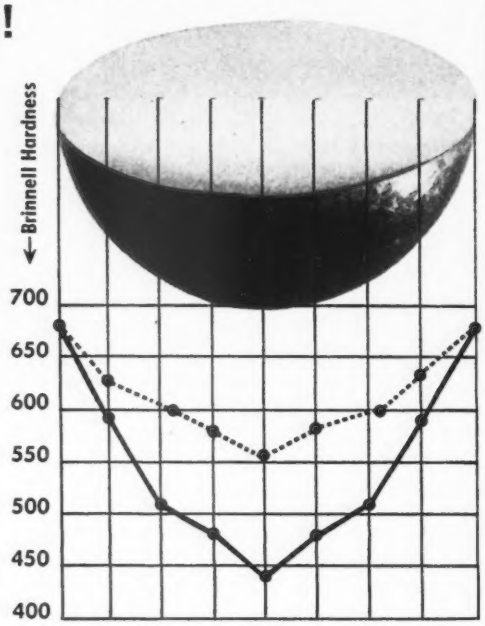
AFCO "IC" (improved carbon) FORGED STEEL GRINDING BALLS

Forged from AFCO's new improved carbon steel, AFCO "IC" deep hardened grinding balls offer deep, penetrating hardness comparable to many types of costly alloy balls—yet they are priced competitively with media forged from ordinary carbon steel.

COMPARE...You'll see why AFCO "IC" Balls are YOUR Best Buy!

Here are hardness curves developed from actual tests on AFCO "IC" deep-hardened 4" ball (solid line), and a 4" alloy ball (dotted line). Note how the AFCO "IC" gives you such alloy-type characteristics as high average volumetric hardness and deep penetration with a "tough" center—at substantial savings in cost.



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IN THE U.S.

ALASKA

Big Hurrah gold quartz mine northeast of Nome on the Seward Peninsula has had to shut down before getting back into production.

Rehabilitation of the old mine has been going on for several months, but because of serious ground movement and caving in the shaft, further efforts to reopen the mine have been abandoned for the present.

Tentative plans are being made for another attempt next year.

Kenai Chrome Co. was pleasantly surprised by an unexpected widening of the orebody to nine feet from the usual two-to-four-foot width. This greatly increases the mine's tonnage potential.

The Bureau of Mines reports that the De Coursey Mountain Mining Co.'s Red Devil Mine is now the leading Alaskan mercury producer. The mine is located on the Kuskokwim River.

Northern Pyrites Corp. has taken a two-year option on the Horseshoe Bay pyrite deposit located on Latouche Island in Prince William Sound. Total option price is reported to be $170,000, starting with relatively small payments. Geophysical exploration is now being carried out on the property by the corporation, which is a subsidiary of Texas Gulf Sulphur Co.

Claims staked on a copper show on the Leduc River just on the Alaskan side of the Canadian border are reportedly being examined by the Kennecott Mining Co. On the Canadian side at this point are the Granduc copper holdings which have received wide publicity and which are yielding excellent exploration results. If the American claims are as promising as the Granduc showings, the Ketchikan mining district will receive a real boost.

It was finally made public that U.S. Steel is one of the parties currently combing Southeast Alaska for iron deposits. They have also been staking the legal limit of limestone claims each month. None of the other parties have yet announced themselves. The search for iron in Alaska is becoming more intense each season.

Klukwan Iron Ore Corp. has been incorporated at Juneau as a subsidiary of Quebec Metallurgical Industries, Ltd., which is controlled jointly by Frobisher Ventures, Ltd., of Toronto.

Capitalized at $1-million, the corporation intends to "engage in mining, mill, concentrating, refining, processing and marketing minerals, particularly iron ore."

Klukwan iron deposits, whose reserves are estimated at upwards to 13-billion tons, have been described by engineers as being the largest remaining undeveloped deposits on the North American continent.

WESTMORELAND COAL HAS FOUR G-E 25-TON DIESEL-ELECTRICS AT ITS HAMPTON MINES. ONE LOCOMOTIVE HAULS AS MANY AS SIX LOADED CARS PER TRIP.

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You can get more productive surface haulage with a G-E diesel-electric locomotive

1. FULL UTILIZATION OF POWER—electric transmission delivers full power for all normal speed and tractive effort requirements.

2. HIGH AVAILABILITY—in normal service, you can expect a G-E diesel-electric to be on the job 24 hours a day, seven days a week, with only about eight hours out for maintenance. It carries sufficient fuel for several days. Refueling and oiling can be carried out during shift changes.

3. FAST, FLEXIBLE POWER—helps speed up your haulage. Response to the throttle is instantaneous. Acceleration is quick and smooth. Reversing is a simple operation.

4. SIMPLIFIED MAINTENANCE—there's no fire-cleaning, ash-handling, watering, or watching, because a G-E diesel-electric does not have boiler or fire-box. Neither does it have mechanical transmission with its inherently high maintenance.

5. EASIER ON THE TRACKS—smooth traction, short wheelbase, low weight per axle, add up to less wear on your tracks. A G-E diesel-electric has no dynamic augment or heavy reciprocating parts to place undue strain on the tracks.

6. HAZARDS REDUCED—the G-E diesel-electric does not emit smoke or harmful gases. It is ideal for use in mining operations.

G.E. makes diesel-electric locomotives in seven standard sizes: 25, 35, 45, 50, 65, 80, and 95 tons. Ask your G-E Apparatus Sales representative for more details about them. Or, write to: General Electric Co., Section 120-70, Schenectady 5, N. Y.

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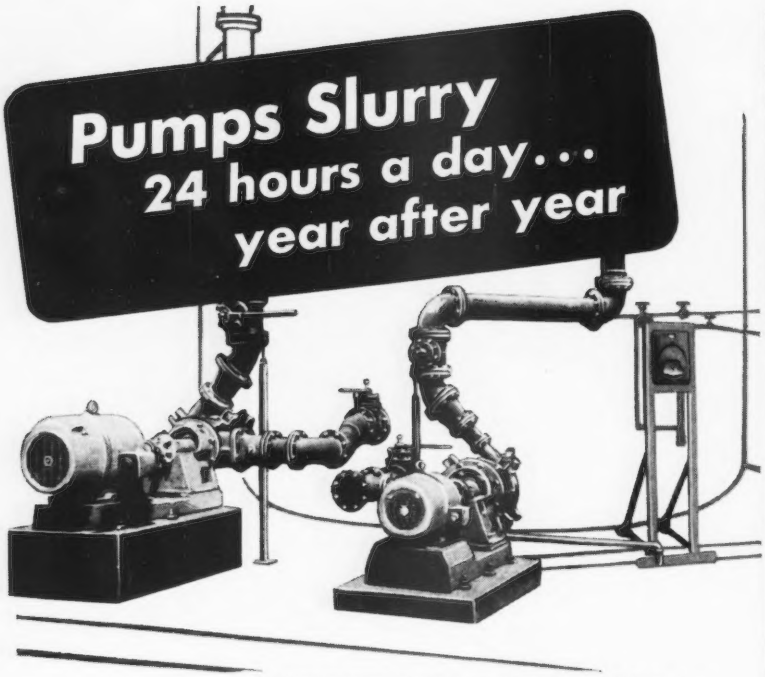

● MORRIS TYPE R SLURRY PUMP at the left is on continuous 24-hr. duty delivering 1000 GPM of a 170° lime slurry at 100′ head. Fifty-HP motor operates at 1180 RPM. Intermittent-duty pump at right delivers 200 GPM at 50′ head with 7½-HP motor turning at 880 RPM.

In slurry-handling operations, "long-term service" is a meaningless claim unless the pump will work day-in and day-out with a minimum of maintenance time, trouble and expense

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To provide uninterrupted service . . .

The gland is under suction pressure only. This reduces leakage and dilution . . . keeps harsh abrasives out of the stuffing box . . . practically eliminates packing troubles.

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To make installation and dismantling easy . . .

Shell is interchangeable for right or left hand rotation. Suction and discharge nozzles can be rotated around the axis of the pump to a total of 72 different locations.

Impeller removed without disturbing the piping. You simply loosen 4 *outside* clamping bolts and pull off the end cover. This feature alone saves considerable time and labor.

● *Free Service.* Morris Engineers will be glad to recommend the pump best suited to your needs for size, capacity, etc. Send necessary data today . . . include request for Bulletin 181.

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CALIFORNIA

Expansion of mill facilities of Calfornia Quicksilver Mines, Inc. at Williams will increase capacity from 40 to 80 tons a day, the company has announced.

Cost of the expansion will be about $50,000. The decision to increase capacity is a result of finding a pocket of high grade ore which, at present prices, was sufficient to retire the company's bank debt and finance the plant addition.

A small amount of quicksilver is being mined at the Wall Street Mine on Dry Creek near Middletown. This property is leased by M. L. Burrell, who has reopened the lower adit for about 150 ft and installed a single-pipe Rossi-type retort to treat the ore.

Workings are in a ledge of silica carbonate rock, and ore minerals are cinnabar, metacinnabar and native quicksilver.

Mining of quicksilver is underway at the Cloverdale Mine near The Geysers in northeastern Sonoma County, with current production running about 400 tons of ore, or 100 tons of concentrate per day.

Leased by The Mining Division of Buckman Laboratories to supplement production from a neighboring property, the mine was reactivated as an open pit operation in 1953.

Cinnabar, the ore mineral, permeates the shale.

Although the shale layers constitute only a quarter of the orebody, they contain two thirds of the cinnabar. By discarding three-fourths of the rock at the mine, a good grade furnace concentrate is produced.

An exploration program is under way at the Culver-Baer Mine in Sonoma County, a mine with a long record of intermittent quicksilver production.

Acquired in March, the mine will be operated under the name of Buckman Mines, along with other property owned by Buckman Laboratories, Inc.

A hillsite has been cleared for opening a new exploration adit, and mill equipment is being installed. The crew totals 14 men under supervision of V. L. Hill.

According to the state division of mines, California retained first place in quicksilver production in 1953, supplying 65% of the U. S. total or 9290 flasks. Largest producing mines were: Abbott, Lake County; Juniper, New Idria (including San Carlos), North Star, San Benito County; La Libertad, San Luis Obispo County; Guadalupe, Santa Clara County; Cloverdale, Culver-Baer, and Mt. Jackson (including Great Eastern), Sonoma County.

Western Pyromet Co. has signed a 10-yr lease to take over the government magnesium company at Manteca, Calif. for titanium production.

General Manager B. D. Harden said engineers would move into the plant early in September to start six to nine months of experimental work. If they are successful, the plant will be con-

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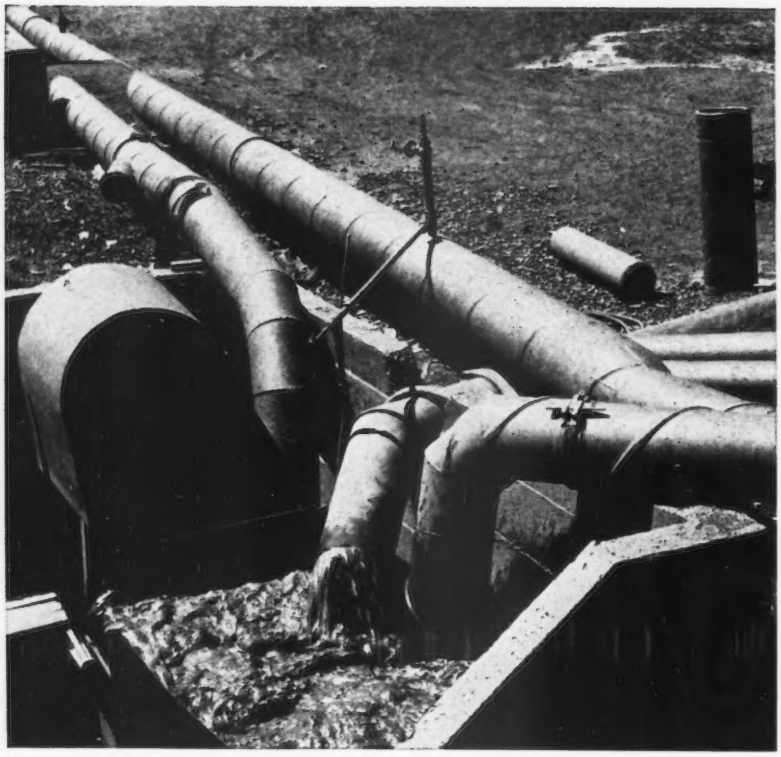

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California *(Continued)*

verted, a project that would cost some $8-million.

The company's plans call for production of 6000 tons of titanium yearly.

Raw material for test operations will be purchased on the open market. After conversion, materials would come from Pyromet's own operations in Nevada and from open market purchases.

COLORADO

Vernon J. Pick made headlines over the Rocky Mountain region with sale for $9-million of his Delta uranium mine in Emery county, Utah, to Floyd Odlum's Atlas Corp.

Pick said he would stay on for six months as president of Delta Mines, which will become a wholly-owned subsidiary of Atlas Corp.

The Delta Mine property includes 12 claims in the Temple Mountain area, 75 mi southwest of Green River, Utah. Pick said 10 of the claims were original stakings he made June 21, 1952.

Approximately 300,000 tons of uranium ore with an in-place value of $40 a ton has been blocked out in the Delta mine, Pick said. Atlas Corp. spokesmen said only 2.54 per cent of the 12-claim area has been blocked out. Pick said the mine has produced 17,000 tons of uranium ore at the rate of 1,500 tons a month. Atlas is expected to increase production to several times that figure.

Pick, 51, had only $300 when he made the Delta strike in June 1952. He had been prospecting for nine months.

Pick and his wife came west in 1951 after his under-insured electric shop at St. Cloud, Minn., burned, leaving them with only $6,000 after all outstanding debts were paid. They were on their way to Mexico on a vacation trip when they heard about the uranium activity on the Colorado Plateau and changed their course.

Plans for immediate construction of a pilot plant in Grand Junction for the testing of a new intermediate step in uranium ore processing were announced by Blair Burwell, president of Minerals Engineering Co.

Burwell said initial cost of the plant will be about $60,000. Expansion is planned as rapidly as justified.

Processes to be tested may lead to construction of many small plants near mining centers over the plateau, for concentration of ores. This would cut the high cost of hauling raw ore long distances.

Discovery of uranium ore in northern Eagle County near McCoy was reported by Bill Orgish, whose ranch is near the strike. Orgish said ore was found in connection with fossil beds in the Morrison formation. About 200 acres in the area have been staked.

For the first time, the stockpile of uranium ore at the U.S. Vanadium mill at Rifle is being assessed by Garfield County. County Assessor Francis O.

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Colorado *(Continued)*

Bradley set the assessed valuation of ore on hand at $20,000.

Drilling at the Lost Dutchman claims 14 mi southwest of Gateway disclosed ore with promising uranium oxide content in an 18-foot seam.

Vanadium Corporation of America expected to place a new uranium ore roaster at its Durango plant in operation Oct. 1.

Dennis W. Viles, vice president in charge of mining operations, said the new roaster and construction of a concentrating unit at the Monument No. 2 mine in Arizona would increase the capacity of the Durango plant by 25%. The new roaster was built by VCA workers.

Kenneth Erickson, formerly of Henderson, Nev., is directing operations for the new Minerals Mining & Milling Co. which has leased the Union Carbonate properties near Rico.

The property contains several thousand tons of low grade lead carbonate ore. Ore will be treated in the Edwards mill north of Rico, built about two years ago and never used. Erickson said he expects to mill 100 tons of ore a day.

The operating firm was incorporated by a group of Colorado Springs and Phoenix, Ariz., investors.

Paul B. Martin, counsel for the AEC operations office at Grand Junction, disclosed plans for doubling the capacities of uranium mills at Grand Junction, Shiprock, N.M.; Blue Water, N.M., and Monticello, Utah.

A new plant at Moab, to be the largest on the Colorado Plateau, also is being considered, he said.

Silver Bell Mines Co. has suspended lead and zinc mining at Ophir. General Superintendent A. A. Smith said the mine would be shut down completely after present reserves have been pulled and milled. Milling probably will be completed in November, he added. Machinery will be removed from the mine and cleaned for storage.

Silver Bell company is going into uranium mining, and expected to start drilling on property on Monogram Mesa, in Montrose county, in mid-September, it was reported.

Goldfield Development Co. expected to be shipping ore by October from its seven Lucky Strike uranium claims in the Calamity Mesa area of northwestern Colorado. Sampling indicated an ore value of $65 a ton.

Colorado Mining Corp. is working the copper property of the old Farwell Mountain Copper Co. near Hahns Peak, 28 mi north of Steamboat Springs. W. I. Hoklas of Steamboat Springs is field engineer for the company.

A number of uranium claims also have been staked on the east side of Hahns Peak.

Possible new uranium areas were indicated with reported discoveries in the

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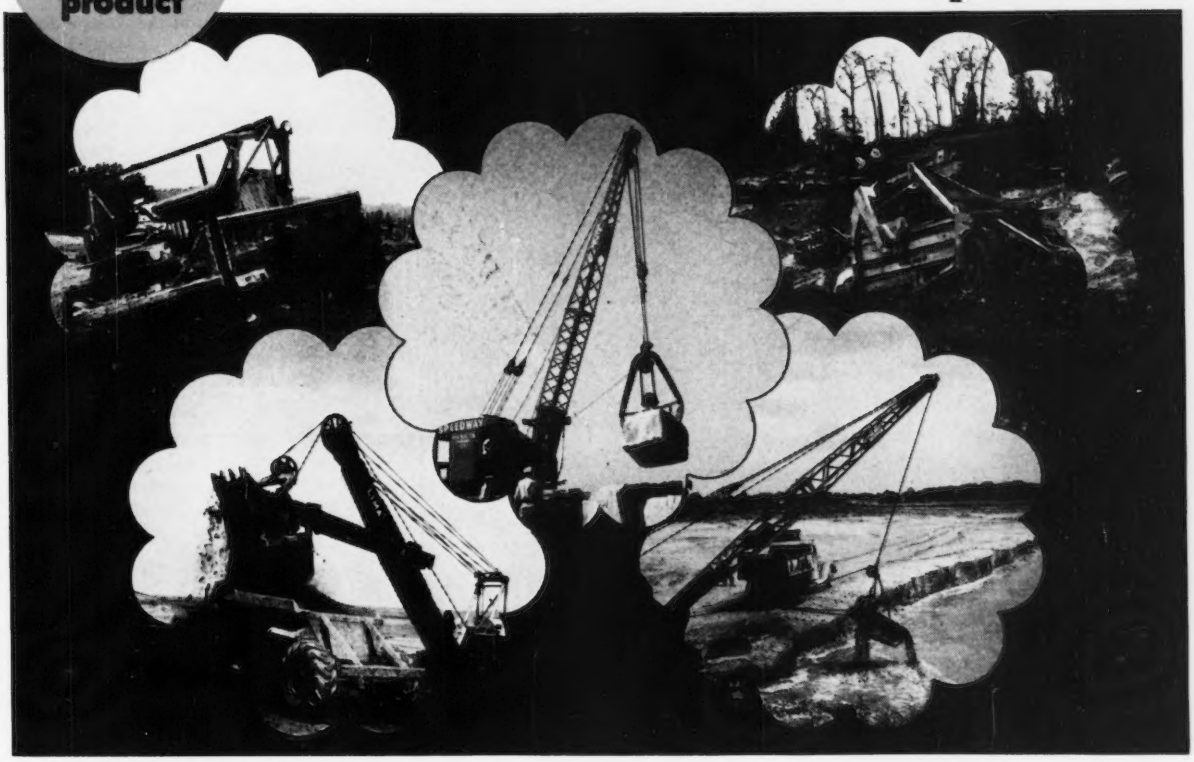

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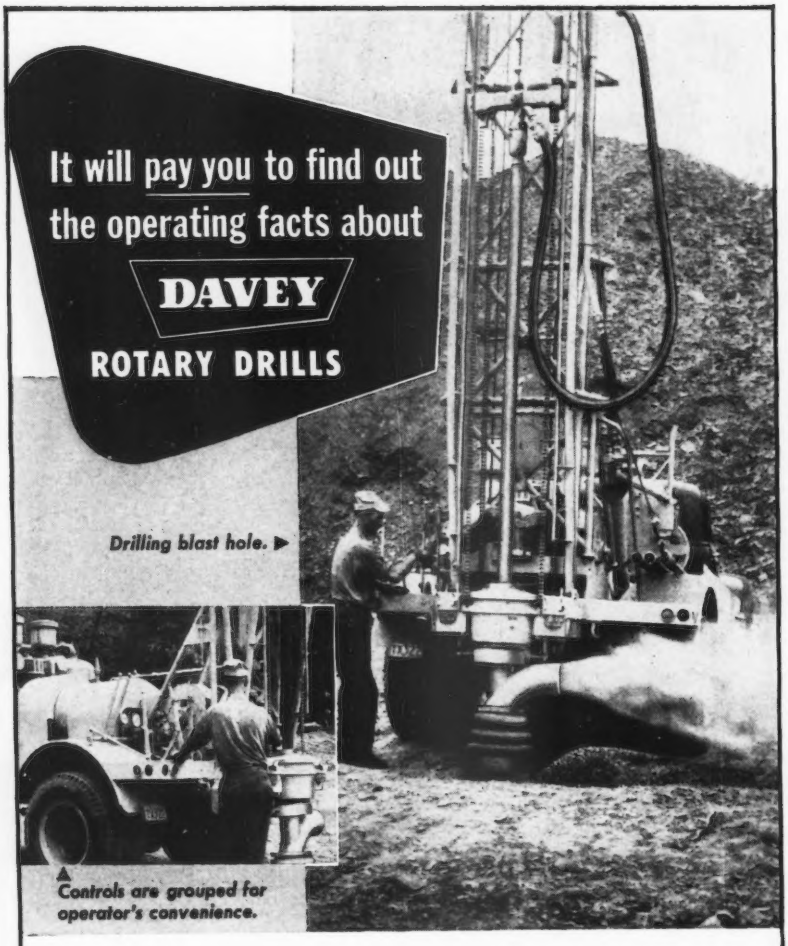
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Colorado (*Continued*)

Animas Valley north of Durango and on Folsom Mountain northeast of Durango, in La Plata County, and in the Upper Piedra river district of Archuleta County.

Exploration division of the Atomic Energy Commission's office in Grand Junction has assigned two men to the Durango area to assist in evaluating the uranium ore possibilities in that area.

Robert Rock, party chief of the AEC reconnaissance program, and Paul Storm, geologic aide, set up offices in Durango. Rock explained he and Storm will examine sites of possible uranium discoveries and examine samples to determine the mineral content. The pair will give general geological advice to those persons interested in uranium prospecting, also.

Leadville Lead & Uranium Corp. is the new name of Leadville Lead Corp. of Denver, result of the firm's increasing activity in uranium. Chandler Weaver of Denver, executive vice president, said the company has contracted with Hans Lundberg, Toronto geophysicist, for an airborne geophysical survey of the firm's 3 sq mi of properties in the Mosquito Range east of Leadville.

Latest acquisition is 320 acres in Lisbon Valley and 168 acres in Island Mesa, 1½ mi from Lisbon Valley, Utah. The properties have produced uranium ore under previous owners. Leadville Lead is now conducting core drilling there.

Paul Hunt Construction Co. has completed a 350 ft uranium prospecting tunnel on the Jack Hoskinson mineral claims near Fish Creek in northwest Colorado. Development on this group of claims began early last spring following several tests.

Colonial Uranium Co. of Grand Junction, Robert Ludwig, president, is said to be planning the erection of the first concentrating plant to produce commercial grades of thorium concentrates from domestic thorite ores.

The company is making a survey of the Gunnison-Powderhorn area for a millsite where power, water and stockpile facilities suitable for future expansion are available.

The need for more uranium processing facilities on the Colorado Plateau will be met by construction of new mills and expansion of existing facilities.

AEC reports that Climax Uranium Co., which operates a processing mill in Grand Junction, is among those considering an expansion. Marvin L. Kay, vice president and general manager of Climax, confirmed that the firm is making plans for an expansion of its activities.

Expansion also is planned, AEC said, by Vanadium Corp. of America, which operates mills at Naturita and Durango, and Vitro Uranium Co. which has a mill in Salt Lake City.

Absaraka Uranium Inc. recently purchased the Radium Queen Mine on the

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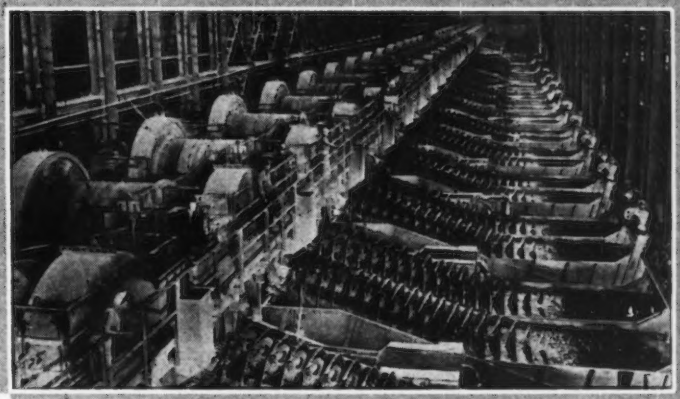

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Colorado *(Continued)*

Carpenter Ridge area near Paradox and has begun shipping ore to the Uravan mill.

E. U. Swalberg is in charge of field operations.

Farncomb Hill pipeline to pump water from French Gulch has been installed to the top of the hill near Breckenridge. As this placer operation gets underway, it will permit the workings of all of Farncomb Hill on the Swan side.

On the Swan River, a new placer machine was moved in last week onto the ground of the Natomas Co. and that of Claude Roberts. This operation will begin at the mouth of Galena Gulch.

Bear Creek Mining Co., Kennecott Copper's exploration subsidiary, has started its second diamond drill hole on Greenback Mountain in the Bonanza mining district, Saguache County. The exploration projects are under the supervision of Dr. James Boyd, manager for Bear Creek, who has headquarters in New York City.

Jack Morrison of Silverton, one of the owners of the Los Ochos Mining Co., has announced that mining operations have started on the uranium property 18 mi southeast of Gunnison on the Irving G. Youmans ranch.

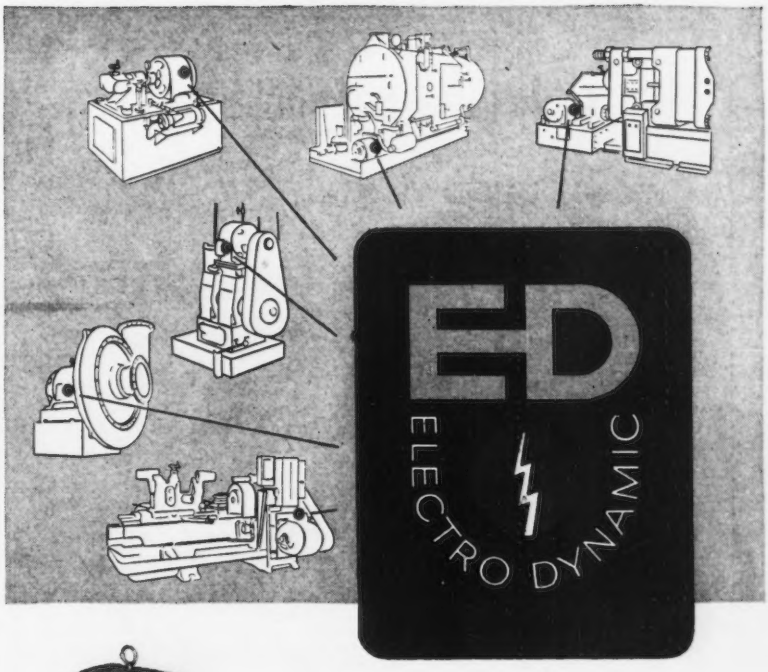
At least 25 mines on the Colorado Plateau will be in the $1-million bonanza class, says Armand J. Eardley, acting head of the Geology department University of Utah. Dr. Eardley addressed a Salt Lake Exchange Club luncheon. He said some 75 mines contain orebodies that will produce 1000 tons of uranium ore or more. The geologist said that the plateau area cintains 8½-million acres of speculative value, of which half has been staked by 9375 groups holding 187,000 claims.

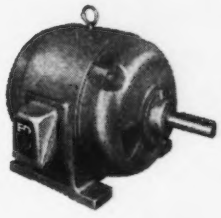
Lead and zinc mining operations at the Silver Bell Mines Co. at Ophir have been suspended and the mine will be shut down completely after present reserves have been pulled, it was reported by A. A. Smith of Telluride, general superintendent. The Silver Bell Co. has gone actively into the uranium mining business, having acquired property on Monogram Mesa in Montros County. Drilling operations there began last month.

IDAHO

A program of exploratory diamond drilling is currently underway at the Silver Mountain Lead Mines Co. property in the Hunter Mining District east of Mullan.

The first hole is being put down just west of Daisy Gulch on the old Idaho Silver claims, now consolidated with several other properties under the Silver Mountain firm. Plans calls for three 1000-ft holes at intervals of approximately 2000-ft intervals along the east-west length of the claims, to provide geological information to serve as a





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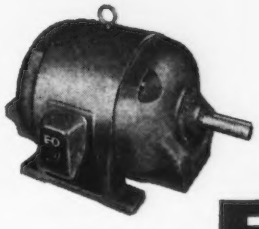

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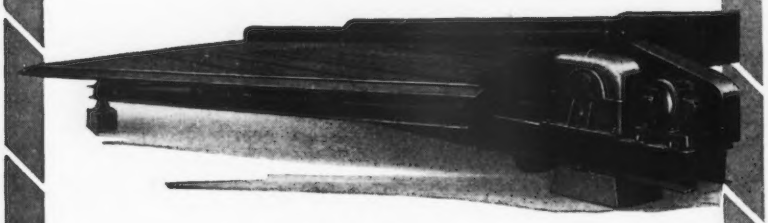

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guide for shaft development scheduled to be started next year.

The work is being done by Hecla Mining Co. and Bunker Hill & Sullivan Mining & Concentrating Co. under a profit-sharing agreement with Silver Mountain.

Western Silver-Lead Corp. and Square Deal Mining & Milling Co., equal partners in joint-lease uranium prospect in the Yellow Cat District of Grand County, Utah, have expanded their Utah interests. They have acquired an option on the mineral rights to 37 claims on patented homestead ground in the Big Indian Wash area of San Juan County, adjoining a property owned by Climax Uranium Co., one of the largest operators on the Colorado Plateau.

Exploratory test drilling of the original Yellow Cat area prospect is already in progress and results are reported as "very encouraging".

Primitive Exploration and Finding Co. has consolidated its property in Blaine County, west of Hailey, site of the original uranium discovery in the area, with other properties under the recently-organized Hailey Trust and a contract for development of the consolidated ground has been let to Hardee Exploration Co. of Casper, Wyo., in order to step up progress.

Bulldozers have removed over-burden to a depth of 40 feet at one "hot spot" on the claims and a shaft is now being sunk to a depth of 30 ft to serve as a station for diamond drilling. Assays of ore from the area have tested up to $147 per ton in fine grained uraninite (pitchblende).

Westvaco Mineral Products Division of Food Machinery & Chemical Corp. of New York, which operates a large elemental phosphorus plant at Pocatello, has acquired extensive deposits of high-grade phosphate rock and shale in Rich County, Utah. The Utah tract, which contains millions of tons of phosphate reserves, is understood to be the last known, large patented deposit in the west.

A $3-million improvement and modernization program started in 1951 at Bunker Hill & Sullivan Mining & Concentrating Co.'s lead smelter at Kellogg was reported to be "largely completed" when the new 202-ft smoke stack was placed in operation early in August. Razing of the old stack, used since 1917, was one of the remaining jobs.

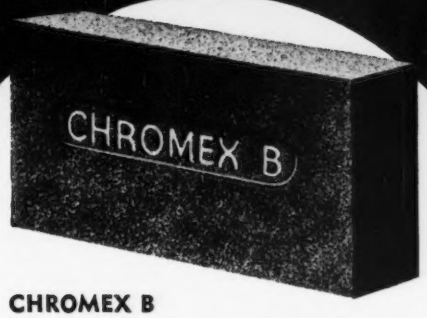
The program included installation of a Wheelabrator baghouse and a three-unit charge preparation plant. All new facilities are in operation and performing satisfactorily.

Deep exploration of the Atlas Mining Co. property east of Mullan has been suspended indefinitely by Hecla Mining Co. the operating firm, and New Jersey Zinc Co., its partner in financing the project. Negative results of initial exploration on the new 2400-ft level, coupled with the sharp decline in the prices of lead and zinc, are largely responsible for the shutdown.

for maximum life of furnace linings . . .

HARBISON-WALKER

BASIC REFRACTORIES

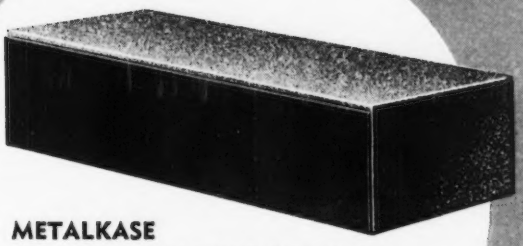


CHROMEX B

This is an exceedingly hard-fired chrome-magnesite refractory, widely used in many ferrous and non-ferrous metallurgical furnaces. Important features are its good resistance to thermal shock and its unusual volume stability and high strength at high temperatures.

H-W MAGNESITE

The standard hard burned magnesite brick for more than half a century now has a magnesia content exceeding 90 percent, which represents an appreciable margin over the conventional product of previous years. This excellent composition together with its high density and stability of volume account for the wide preference this refractory continues to gain for use in various metallurgical furnaces.



METALKASE

The pioneer metal-encased basic brick, developed by Harbison-Walker for maximum spalling resistance among basic refractories. In many applications the use of METALKASE increases furnace life by many times.

Through extensive research and wide experience in the use of basic refractories Harbison-Walker has developed the products especially suited for the most comprehensive range of applications. More than a dozen different classes of Harbison-Walker basic brick and several kinds of basic ramming mixtures are available for the fulfillment of every specific requirement.

HARBISON-WALKER REFRACTORIES CO.

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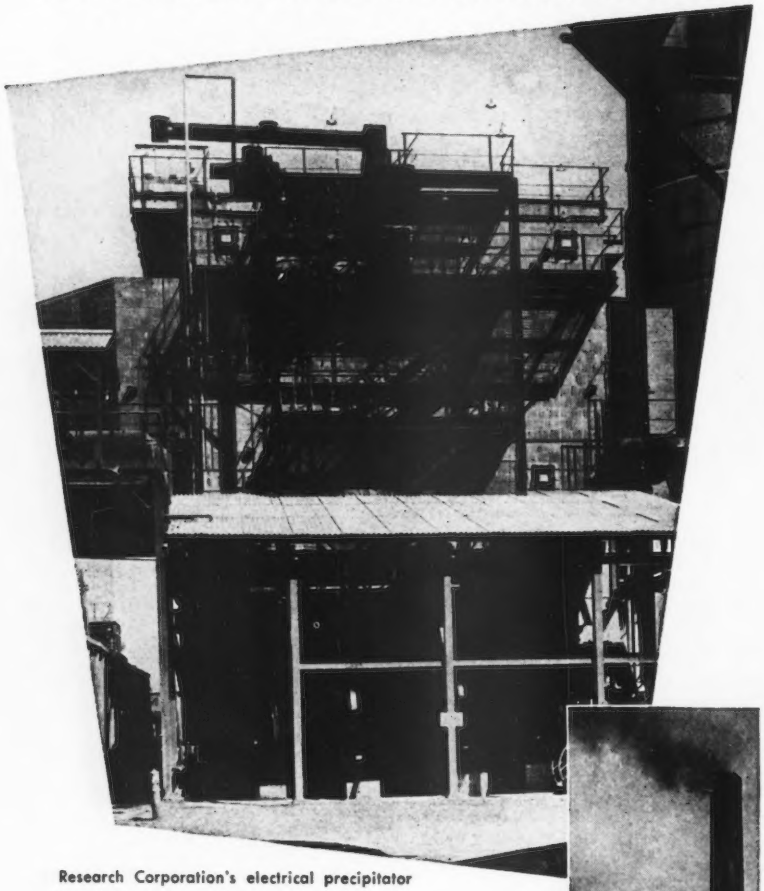
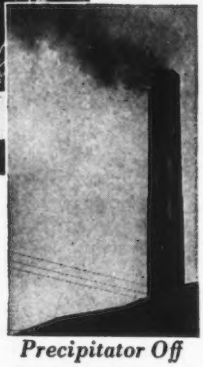
World's Largest Producer of Refractories

New Jersey Zinc

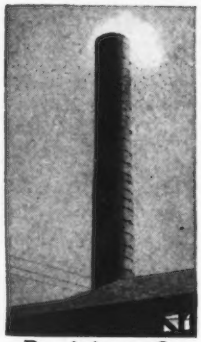
Recovers Values from Fume



Research Corporation's electrical precipitator installation at the Palmerton, Pa. plant.



Precipitator Off



Precipitator On

The two photographs (right) show the results of this Research Corporation installation. The smoke in the picture at the top (Precipitator Off) consists of dry dust and fume entrained in the zinc ore sintering machine gases.

The picture at the bottom (Precipitator On) shows nothing but water vapor escaping from the same stack.

If you have a fume problem that involves recovering valuable materials that are going up the stack or combating a smoke nuisance, get in touch with your nearest Research Corporation representative. His experience with over 300 roaster and metallurgical precipitators will enable him to advise you on the most effective—and economical solution to your problem.

RESEARCH CORPORATION

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Idaho *(Continued)*

Under the project, started in 1951, the Atlas shaft was deepened from the 800 to the 2,400-ft level, and some 1,500 ft of lateral exploration, plus extensive diamond drilling, was done on the new level, mainly in the Carbonate Hill portion of the property, but no appreciable ore showings were disclosed.

Atlas stockholders have agreed to permit Hecla and New Jersey Zinc to retain their option rights until January 1, 1956, without further work requirements other than annual assessment work. Newmont Mining Corp. was an equal 25% partner in the original venture but withdrew last December, assigning its interest to Hecla and New Jersey Zinc in equal shares.

Only about 1,500 ft of the property's 12,000-ft east-west length has been explored at depth.

A new lower tunnel at the Wonder property in Lemhi County, driven by Defense Metals Inc., has exposed a sizeable deposit of radioactive ore. A 135-ft length of ore varying from 6 in. to 3 ft in width has been opened by drifting so far and samplings indicate a substantial improvement in grade from upper level exposures. The work is being done under a DMEA contract which provides for 90% Federal aid.

Parker Mine, well-known in the early days as producer of some of the highest-grade silver and lead ore shipped from the Wood River Valley, is being worked again.

Current lessee, Mother Lode Trust, Ketchum, reportedly has discovered good silver-lead values by bulldozing. Heber Comer, of Ketchum, a trustee and manager of the Mother Lode Trust, said that there are 4000 ft of tunnel work on the property, that milling ores still are intact and that diamond drilling to lower depths is planned.

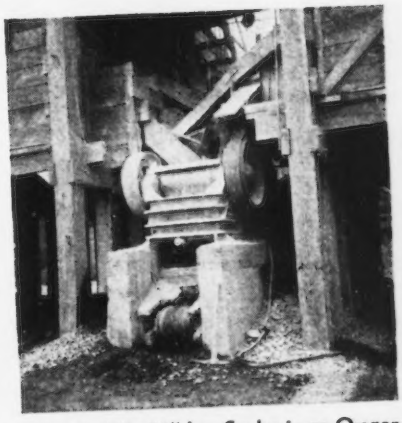
National Uranium Corp. has concluded a profit-sharing development agreement with Silver Buckle Mining Co. which provides for exploration of three groups of claims in the Big Indian area of San Juan County, Utah, held under lease by the Silver Buckle firm. Exploratory drilling at one of the groups, a five-claim property at the mouth of Big Indian canyon, was scheduled to get underway by mid-September.

National Uranium also has under lease a 10-claim group in the Coyote Wash district of San Juan County and an 8-claim group on Courthouse Wash in Grand County, northwest of Moab. One drill hole on the latter group was completed to a depth of about 460 ft early in August to gain geological information on which to base thorough exploration.

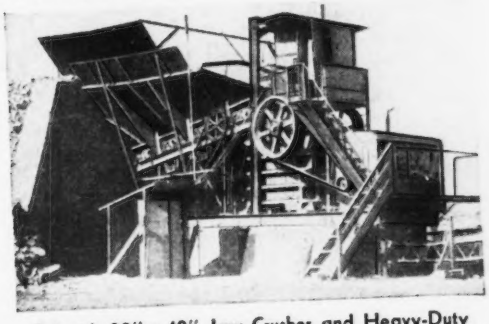
Inspiration Lead Co. Inc. reports that preliminary work on its 8-claim Bee group of uranium claims in the Big Indian District of San Juan County, Utah, has disclosed a 4-ft thick ore bed of acceptable grade in the Salt Wash member of the Morrison formation. Preparations for putting the property in production are in progress.

for BIG capacity

18" x 32" Telsmith Jaw Crusher and Heavy-Duty Apron Feeder in central Wisconsin quarry plant.

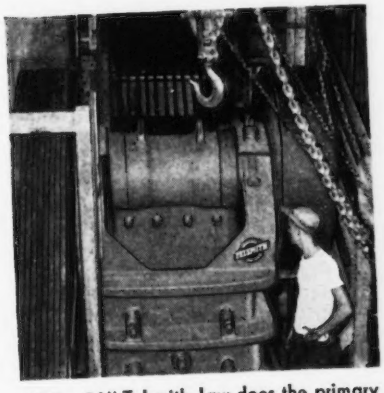


Telsmith 10" x 36" Jaw Crusher in an Oregon sand and gravel plant.



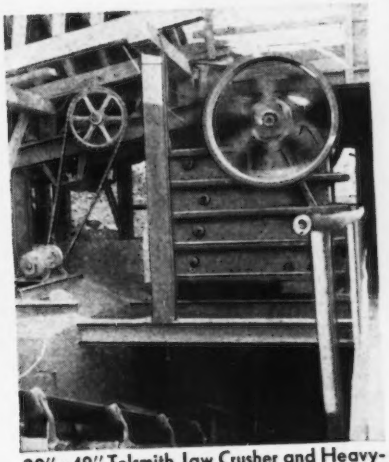
Telsmith 30" x 42" Jaw Crusher and Heavy-Duty Apron Feeder build airports in North Africa.

TELSMITH JAW CRUSHERS



25" x 36" Telsmith Jaw does the primary crushing of ore in British Columbia mine.

SEND FOR BULLETIN 280



30" x 42" Telsmith Jaw Crusher and Heavy-Duty Apron Feeder in Pennsylvania quarry.

18" x 32" Telsmith Jaw Crusher, Heavy-Duty Plate Feeder and Rotary Grizzly in New York gravel plant.

J-1

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Idaho *(Continued)*

Sunshine Mining Co. has opened the Chester vein on its new 3850-ft level. A long crosscut from the No. 5 winze cut the big structure in the Omega area which is shared equally by Sunshine and Polaris Mining Co. The point of intersection was west of the west limit of the ore zone, as indicated on upper levels, and drifting toward the ore is now underway.

A new crosscut toward the vein on the new 4000-ft level has also been started.

Another Coeur d'Alene District company to enter the uranium field in Utah is Highland-Surprise Consolidated Mining Co. The firm has taken an option to purchase outright, without future royalties, a 24-claim property in the Henry Mountains area of Garfield County, on the indicated strike of ore-bearing channels proved by test drilling on the adjoining claims of Tri-State Natural Gas Co. of Texas. Plans for exploration work have not been disclosed.

The company has also acquired a purchase option on 11 claims in the Salmon District of Lemhi County, Idaho, on which ore has been discovered.

Company operations at the lead-zinc mine on Pine Creek in the Coeur d'Alenes are confined to exploration work in a westerly heading on the 1,450-ft. level. The only production is by leasers in old upper workings.

The new three-compartment shaft which Silver Buckle Mining Co. is sinking at the Vindicator Silver-Lead company property east of Mullan is progressing at the rate of about 4½ ft per day, on a three-shift basis, and is expected to be completed to the objective depth of 800 ft by November.

Extensive exploration of the big Vindicator vein from the 750-ft elevation will follow.

Idaho Consolidated Mines Inc. now has milling facilities available at its Twin Peaks silver-lead-copper-cobalt mine in the rugged Salmon River Mountains of Lemhi County. A new, 125-ton, all-electric flotation concentrator, powered by a 100,000 watt diesel generating unit, was put through its shake-down run in August. The plant is designed for expansion to 500 tons per day if mine production warrants. Several stope faces have already been prepared for mining.

Simplot Co. of Boise has resumed operations at its open-pit barite mine near the head of Deer Creek in Blaine County. Heavy equipment has been moved in to the property and plans are to mine about 40,000 tons of barite.

Idaho Garnet Abrasive Co., operating at Fernwood in Benewah County, is one of the nation's leading producers of high-grade garnet-abrasive material. The company operates a drag-line dredge on Emerald Creek, working garnet deposits which are reported to be among the richest ever discovered.

The gem-stones, which have a hardness only slightly less than that of diamonds, are separated from the creek gravels by screening and jigging, and then trucked to a crushing and grinding plant for processing. The plant is capable of turning a car-load of abrasive material every 12 hours.

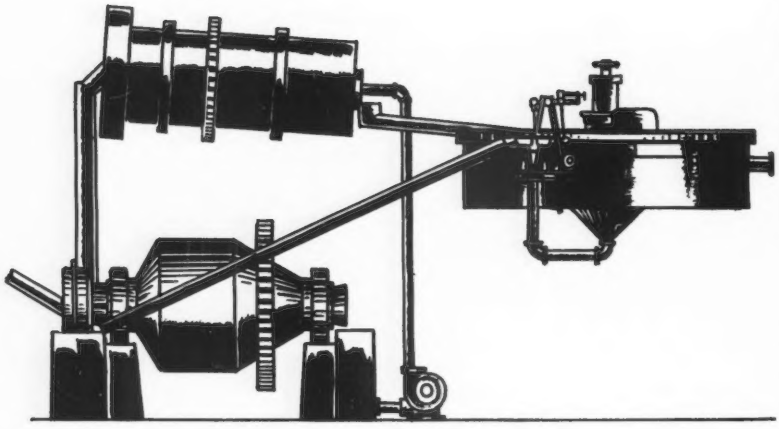
Oscar Moe supervises the drag-line mining operation and Herschell Tripp is general superintendent.

U. & I. Uranium Inc., operating firm for six Kellogg mining companies in the Utah uranium fields, has encountered ore of commercial grade in three out of the four holes drilled thus far on the Radon group of claims in the Big Indian District of San Juan County, Utah. Indications are that the ore body, now being outlined by further drilling, may be one of the major strikes on the Colorado Plateau.

Chemical assays of the first hole showed an average of 0.622% U_3O_8 over a width of about 4½ ft and an average of 0.387% over an 8½ ft width. The ore in the second hole was reported to be twice as thick and at least as good in grade.

The claims appear to be in the heart of a productive ore channel. Homestake Mining Co. has intersected rich ore in drilling on three sides of the Radon group.

HARDINGE CLOSED-CIRCUIT WET-GRINDING SYSTEM



The Hardinge wet-grinding circuit illustrated here is capable of producing an end-product in the range of 28 mesh without Hydro-Classifier and as fine as 10 microns with Hydro-Classifier. It provides positive control of sizing and moisture.

The Conical Mill discharges to a Counter-Current Classifier which returns the oversize by gravity to the feed end of the mill for regrinding. For ultrafine products, the Counter-Current Classifier product goes to a Hydro-Classifier for further separation. The oversize is returned to the mill or used as a secondary, uniform product. Bulletin 39-B-1.

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The U. & I. firm is also making preparations for exploring its 20-claim Rocket group in the Bull Canyon area of Grand County, west of Moab. This is an area where the favorable ore-bearing Chinle formation lies close to the surface.

The six Kellogg firms associated in the venture are Caledonia Silver-Lead, Nancy Lee, New Era, Signal, Coeur d'Alene Silver Giant and Silver Bowl.

Polaris Mining Co. has cut fair-grade silver-copper ore in two drill holes 60 ft apart in the Chester vein in Chester Mining Co. property at a depth of 3000 ft.

The ore strike, which was made near the western boundary of Chester ground, is the first encouragement obtained in several months of drilling and tunnel exploration.

One hole 140 ft from the west property line showed 23.5 oz of silver per ton, with minor lead and copper values, over a 4½ ft width. The second hole, 60 ft farther west, showed 20 ft of mineralization. Sludge samples, not always reliable, showed 21 oz of silver, with some lead and copper, for the first five feet and 106.8 oz of silver, 3.17% copper and 1.2% lead for the next five feet. Values in the balance of the vein were small.

Plans are to drill the ore structure at greater depth and to open the 3000-ft level showing by drifting. Polaris Mining operated the property under a profit-sharing agreement with Chester.

Hypotheek Mining & Milling Co. has intersected two zones of mineralization in the second test hole drilled on its uranium prospect in the Coyote Wash area of San Juan County, Utah. The find was made at a depth of about 430 ft in the 760-ft hole through instrument tests conducted by the Atomic Energy Commission. Importance of the discovery will not be known until final results of the AEC tests are disclosed.

Whitedelf Mining & Development Co. has started a 1100 ft south crosscut on its new 800 level to explore for the downward extension of two known ore bodies, one of which is now being mined by leasers above the 400 level. About 120 ft of progress had been completed by the first of September and it was expected that the first vein objective would be reached within 30 days.

Radioactivity has been found in two large veins opened recently on the Mike Carney property on the South Fork of the Clearwater River in Idaho County. One of the veins is a copper-gold structure and the other shows values in mercury. Surface trenching to expose the veins has been started.

ILLINOIS-KENTUCKY

Purchase of domestic metallurgical-grade fluorspar under the Government's stockpiling program were scheduled to start last month, A. J. Walsh, commissioner of Emergency Procurement Service of the General Services Administration, told Illinois-Kentucky fluorspar producers.

Mines of the district, closed down for several months for lack of business, are expected to reopen at that time.

Direct contact will be made by General Services Administration with each producer, and no broker will be used.

"It is not necessary that any producer of fluorspar sell his material through a middleman, or a broker," Walsh said; "it is our intent to contact every producer, and you can assure these producers that when the plan is formulated which will permit us to proceed with the purchase that we will be in touch with them direct." Specifications will be sent to the various producers.

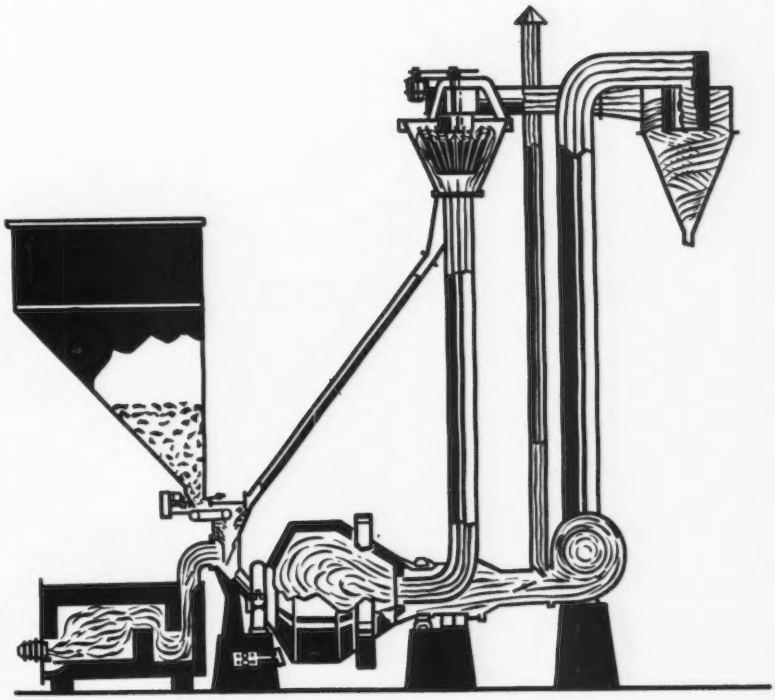
Producers are enthusiastic about the proposed plan, and it is believed that all of the district's mines will be kept in operation with their entire metallurgical output required to fill the national stockpile order.

MICHIGAN

A simple process known as timber-bundling has added much to underground mining efficiency at Pickands, Mather & Co.'s Newport mine in Ironwood.

The bundling process requires only a

HARDINGE CLOSED-CIRCUIT DRY-GRINDING SYSTEM



The arrangement illustrated here is known as the Hardinge "Thermomill" system because of the air heater, an optional feature for dry grinding moist materials. The Hardinge "Gyrotor" Air Classifier is designed for extremely close control of product down to the micron range. A Hardinge Conical Mill fed by a Hardinge Constant-Weight Feeder is also shown. Bulletin AH-449-1.

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By keeping drifts open . . .

"COMMERCIAL" STEEL SETS
Reduce Costs in Block-caving Mining

Block-caving method of ore mining is more profitable when "Commercial" circular steel sets are installed in mine drifts because more continuous and more uniform draw of ore reduces mining costs. Circular steel sets provide support needed to keep the drifts open and serviceable long after timber sets would fail even in heavy ground.

The installation of "Commercial" steel sets is simpler and easier than standing timber; normal maintenance cost is less because minor repairs are reduced to a minimum. Costly shutdowns and delays are avoided; in fact, the entire operation is speeded up.

"Commercial" was first to produce circular steel sets. An established product for years again has found acceptance in another more recent application which has helped to reduce the hazards in block-caving mining.

Pounds of "Commercial" circular sets will increase the ore draw in tons.

THE COMMERCIAL SHEARING AND STAMPING COMPANY
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"PRODUCTS PREFERRED BY CUSTOMER ACCEPTANCE"

"Commercial" engineers will gladly assist you; they have the experience and know how.

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4A-4

few tools, a metal crib, a ratchet-type stretcher to bind the steel band around the bundles and a crimping tool to fasten the seal which joins the ends of the bands.

Planks are bundled according to length which makes it unnecessary for a miner to dig through a pile to find the length he requires. Lagging also is similarly bundled. Superintendent Schieber of the Newport Mine states that efficiency in the handling and transportation of planks and lagging from surface to underground has been greatly improved. The new method also has reduced underground housekeeping problems by almost eliminating the chips and bark that formerly accumulated.

Twenty-six men of the M. A. Hanna organization on the Menominee Range have received mine rescue training at the new and modern district rescue station located at the Cannon mine near Stanbaugh. The training was conducted by 20 2-hr classes.

MINNESOTA

Of the seven iron ore ranges in Minnesota and Michigan (including the Fillmore County mines) the highest average in natural iron and the lowest in silica for 1953 came from the Vermilion range with 60.39 in natural iron and 7.84 in silica.

Steep Rock's average (with total shipments about the same as those from the Vermilion; not included in the seven ranges) had a silica content of 7.42 with a 51.49 natural iron.

Other range natural iron averages were: Gogebic, 52.27; Marquette, 51.14; Mesabi, 50.31; Menominee, 50.13; Fillmore County (southern Minnesota) 48.56 and Cuyuna, 42.82.

The Mesabi Range's total of 76,293,534 tons was nearly 78% of the Lake Superior area's total, including Steep Rock and the Michipicoten Range.

As a part of Galand Ore Co.'s dredging project on their "C" orebody lease at Steep Rock, Philip D. Pearson, manager, has announced that contracts have been awarded for the construction of three dams which will create a barrier between Marmion lake and the Seine river.

Also, a 5-mi road is being constructed from Atikokan to Falls Bay on Steep Rock Lake.

Steep Rock Iron Mines Ltd's next dredging project will be on its "G" orebody. The two big 900-ton dredges will be moved this winter and will begin to operate next spring.

Shipments of iron ore from the Lake Superior area for 1954 are more than 18-million tons below the 1953 tonnage on a corresponding date.

West Hill Mine of Pickands, Mather & Co., west of Coleraine, has installed a Therm-O-Wheel heat regenerator in its shop buildings. The exhaust ventilation air, after being filtered, is blown through the upper half of the Therm-O-Wheel

O-B Hanger Puncture Strength Increased 10,000 Volts . . .

ANOTHER MILESTONE in the 50 years of O-B Hanger leadership has been realized with the recent increase in the electrical breakdown strength of O-B Hangers using Dirigo insulation. Previously well above the standard 7,000-volt test requirements, the puncture strength of Dirigo insulation has now been increased by 10,000 volts.

INSULATION IMPROVEMENTS assure you even longer-lasting O-B Hanger wear on both negative and positive trolley lines.

MECHANICAL STRENGTH of Dirigo insulation increased 30 per cent, enabling O-B Hangers to take still heavier punishment.

HIGH RESISTANCE to fungus growth and chemical solvents also stepped up further, contributing to longer hanger life in all types of service.

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Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

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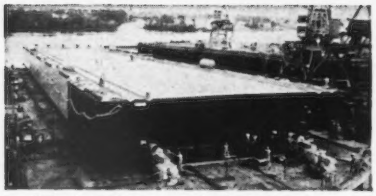
Anywhere—in harbors or undeveloped areas—in faster time with sizable savings in money!

Completed structure August 28, 1952, six months after contract was signed.

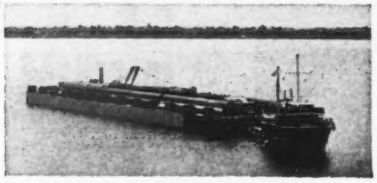
This is the story of the **De LONG DOCK**

APRIL 18, 1952.
First dock section, 82' by 377' ready for launching.
Dock sections were economically fabricated at an Orange, Texas shipyard and launched for towing to dock site.



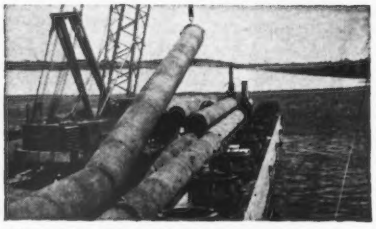
Prefabricated to required size and strength at shipyard.

MAY 21, 1952.
First dock section, arriving at site on Orinoco River, after being towed across 3,000 miles of ocean.



First section loaded with its own caissons and all erection gear and equipment for project.

MAY 22, 1952.
Crane placing 6 ft. diam., 100 ft. long steel caissons in wells fitted with Airjacks. Crane, Airjacks and other equipment were later transferred to second and third sections for erection purposes. Elevation of dock can be regulated to 1/32 of an inch.



After caissons are placed, De Long Airjacks working simultaneously, raise dock section to desired elevation.

A week after arrival at Orinoco Mining Company's site on the Orinoco River, Venezuela, first dock section berths ship, and unloading of cargo begins. Two additional units make this pier 1,130 ft. long, 82 ft. wide, and 15 ft. deep.

No special foundation preparation; no cofferdams. High tides, swift water no obstacle. De Long Docks can be erected under any field conditions.

Write today for illustrated booklet which describes the advantages offered only by the De Long Dock.

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Minnesota *(Continued)*

where a large percentage of the heat it carries is removed by the aluminum wool with which the wheel's pie-shaped segments are packed.

Exhaust air, minus most of the heat it had contained, is then ducted out of the building. As the wheel revolves slowly, the heat recovered from the exhaust air is added to the incoming stream of fresh air before it is carried to the areas to be ventilated. The Therm-O-Wheel at the West Hill Mine has a capacity of 15,000 cfm. The box in which it is housed is 9 ft 2 in sq and 2 ft 2 in deep.

The unit weighs 1100 lb and is operated by a 1 hp motor. A similar, but improved and simplified unit, is being installed at P.M.'s Tioga No. 2 Mine west of Grand Rapids.

At the Tioga No. 2 Mine of P. M. & Co. work is being pushed on stripping, plant construction and road building in preparation for production in the 1955 season. Some ore already has been uncovered.

The water problem which it was thought might be serious because of the nearby lake, has not, so far, been a handicap.

The new iron ore carrier, the George M. Humphrey, has been floated off the blocks at the drydock in which it was built at Lorain, Ohio. It is scheduled to enter service this season.

It has a cargo capacity of 21,000 tons at a 24 ft draft and is driven by an 8500 hp unit. The M. A. Hanna Co.'s fleet flagship, the slightly smaller Ernest T. Weir, and this new carrier give them the two highest-capacity ore boats on the Great Lakes. During the 1953 ore season the Weir carried the largest cargo of iron ore in the history of the Great Lakes.

Lake Superior Mines Safety Council met at Ely Sept 9. W. S. Baxter, mining engineer for the Montreal Mining Co., Montreal, Wis., discussed the foreman's role in accident prevention; G. Carlson, Crosby, assistant master mechanic for P. M. & Co., talked on shop safety; A. L. Beisel, ventilation engineer for P. M. & Co. at Ironwood, Mich., spoke on auxiliary ventilation of surface and underground plants and Ben Kangas, Chisholm, St. Louis County mine inspector, outlined the mine inspector's part in safety. The program was concluded with a movie, "The Gamblers." E. C. Norris, Duluth, is president of the Council.

Ten Great Lakes ore carriers of the Pittsburgh Steamship Division of U.S. Steel have been laid up at Duluth-Superior harbor for the winter. D. C. Potts, president of the Steamship Division, estimates that about $1-million will be spent for repairs and maintenance.

A nation-wide program, aimed at reducing ground-fall accidents in underground mines was outlined at a Lake Superior Mines Safety Council meeting in Duluth on August 20. by G. G. Grieve, Chicago, of the National Safety Council.

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R O O O O M

Mining operations are crowded at best—there's nearly always too much equipment to move in or out of the hole.

That's why CF&I Rock Bolts are so popular with mine operators. Because these bolts are embedded in the walls and ceiling, they afford excellent support without taking up valuable space required by old-fashioned timbering methods.

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- **Improved ventilation**
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- **Faster haulage**
- **Low cost installation**

Let us show you how you can take full advantage of CF&I Rock Bolts in your operation. Write today for additional information.

CF&I Rock Bolts are also available in the expansion shell type with Pattin shell.

CF&I Steel Products for the Mining Industry

Grinding Balls • Grinding Rods • Wickwire Rope
Mine Rails and Accessories • Cal-Wic Industrial Screens

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THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland

Minnesota *(Continued)*

Attending the meeting were mine safety officials and representatives of the U. S. Bureau of Mines. The program, as outlined, will be in the form of a contest, each mine competing with its own safety record. It will begin Jan. 1. Each underground mine will report its own accident record for several preceding years. At the end of 1955, and in succeeding years, awards will be made based on the improvement shown by each mine on its past safety records.

With 24 bids from 13 companies received by the Minnesota State Executive Council for iron ore prospecting on state lands, 11 permits were awarded Aug. 19.

The W. S. Moore Co., Duluth, received five permits; Iron Range Mining Co., Cleveland, two; and one each to the Haley-Young Mining Co. of Hibbing, Pacific Isle Mining Co., Hibbing; F. L. Palarine, St. Paul, Minn. and Park City Consolidated Mines of Ogden, Utah.

The permit awarded to the Haley-Young Mining Co. was for the Mississippi No. 2 Mine at Keewatin which has about 1.7-million tons of ore remaining.

Ray Nolan, state director of the state Lands & Minerals Division, said that two bids were rejected due to discrepencies and action on a third was held up temporarily.

A new high-grade magnetic iron mine located on Rainy Lake in Canada has been opened by two former Chisholm men: Walter K. Steinke and Mel. Ranta. Shipping was expected to begin in early September.

The firm will be known as Stanol Minerals, Ltd. of Fort Frances, Ontario. There are said to be a large number of out crops where ore can be loaded directly by shovels.

It is reported that prospecting surveys have indicated a large tonnage of iron ore deposits in the Peace River area of Alberta, Canada. The report was made by the North West Chamber of Mines which adds that the deposits are considered to be sufficiently important to justify a thorough investigation. The ore is low grade but indications are that it can be readily concentrated.

MONTANA

Anaconda Aluminum Co.'s plant, under construction at Columbia Falls, Flathead County, is expected to go on-stream next July. More than 1100 men now are employed on the project, which was slowed by labor disputes last summer. Within a few months, the number of workers employed is expected to be boosted to 1300. H. G. Satterthwaite is project manager.

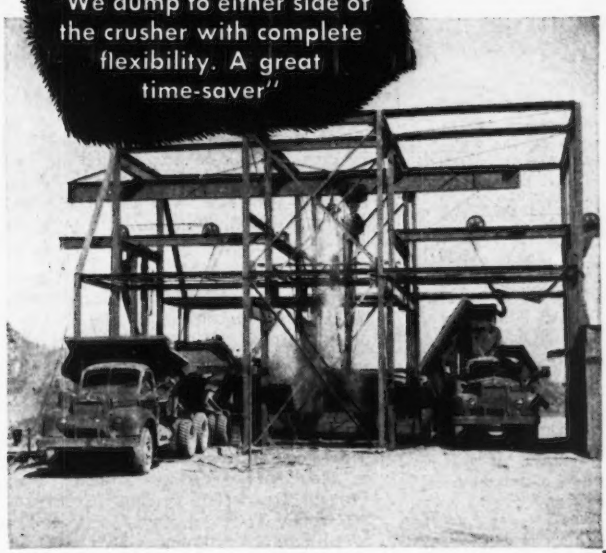
A father and son and a third man have located a group of 10 claims adjoining the Brooklyn Mine in the Philipsburg area of Granite County. Roger F. Little, of Missoula, reports that his son, Robert A. Little, and George T. Croonenberghs currently are exploring uranium possibi-

Change over to tandem hauling for increased capacity at low cost.

1

"Tandem hauling and two-way dumping are two profitable advantages of the Easton side-dump idea"

2



Easton overhead dumping system provides remote stop-and-hold control. Easton two-way dumping permits the tandems to pull up to either side of the crusher at will. *Cab-controlled hydraulic dumping is also available with Easton side-dumps.*

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says MILO CROUSE, Manager of Operations
Buffalo Crushed Stone Corp., Bowmansville, N. Y.

"At comparatively small cost, our changeover from 12 Easton trailers to 6 Easton truck-and-trailer tandems gave us all the increased haulage capacity we needed. Our past experience with Easton side-dumps, through 5,000,000 tons of all-weather production, proved the dependability of Easton equipment. Easton tandems require practically no maintenance; they are on the job day after day, giving fast service to three shovels in two different quarries."

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Montana *(Continued)*

lities on the Philipsburg area claims.

Establishing of the claims followed discovery of radioactive minerals in the graphitic shale and in the scarn, Little reported. He added that assays on tactite from the Colorado Assaying Co. have indicated surface samples carrying 0.06 uranium oxide.

NEVADA

Newmont Mill at Goldfield is being revamped and made ready for operation, was scheduled to start Oct. 1. The work was being done by Consolidated Uranium Mines Inc., of Nevada.

Seven men have been at work on the project under direction of Roy Hardy of Reno, who is consulting engineer for Getchell Mines. The work was expected to cost $25,000, and the mill was designed to treat tungsten ore from the Linca Mine in Smoky Valley where 200,000 tons is blocked out or indicated.

Hauling of ore from the mine to Goldfield was expected to start in mid-September. The mill's capacity is more than 150 tons daily.

Uranium Mines Inc. said that at it tungsten property in Smoky Valley the shaft is now at the 170-ft level and will be sunk 180 ft further. A total of 28 men are employed in the mine, and water was encountered at the 132-ft level. Pumps were installed which took care of the problem. At present they are pumping 10 to 15 gpm.

TVG Mines Co., of Tonopah, has taken over development of a promising uranium find made by Mrs. Charles Goodwin in the north end of Fish Lake Valley. Location work on 25 claims is being done by Mark L. Young, of Manhattan, Nev., who is stripping off the overburden with a caterpillar tractor.

The orebody is said to show a width of 300 ft and extends to several claims. Officials of the TVG Mines Co. are T. J. Nicely, Vic L. Smith, and G. J. Greenwood, all of Tonopah.

Argentum Mining Co. which for the last three years has been treating tailings from the old Candelaria Mining District at its mill in the Columbus area, has announced plans to expand its operations from 50 to 400 tons daily.

An additional building is being put up, and more machinery installed to increase the work now being done by flotation. A good road from Columbus to Candelaria has been completed, and the tailings are being transported by truck. Carl Earl is mill superintendent; 14 men are employed.

Western Explorations Co. is developing the Marshall Copper Mine in northern Elko County, after having taken it over on a bond and lease proposition from Maurice Marshall, of San Francisco and his family.

Western Explorations Co. is headed by Murray A. Schutz, also of San Francisco. The new leasers are drifting 650 ft on the main vein and plan to raise 100 ft on the ore.

Sinking of a 200-ft winze is also planned. Development is being done under a program outlined by DMEA. Production will be stepped up to 100 tons monthly. Ore currently is being shipped to the smelter at Garfield, Utah. An extensive diamond drilling program also is planned.

Ore shipments are being made from a new discovery of lead-silver-zinc deposits in the Diamond Mine of the Consolidated Eureka Mining Co. The ore also contains high grade gold values, according to the company officials.

Discovery was made on a drift at the 300-ft level of the famous old mine.

Some good ore reportedly has been found in the Fairview Mine in the Seven Troughs District of Pershing County.

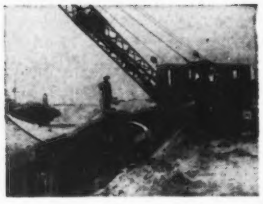
Carl E. Thomsen and Henry Ruckteschler, both of Winnemucca, opened the new vein, and a 150-ft tunnel has been driven toward the discovery. A road has been bulldozed to the site.

The ore shows a width of 18 to 48 in. and values running from $5 to $500 per ton. Walls are reported to be of rhyolite, and they stand almost vertically. Earl Tucker is in charge of the properties.

Dragline capacity is increased up to 50% or more on many jobs when a Crescent Scraper is used. Cast like the regular bucket, it digs into and gathers the load with the ease of a plowshare, hauls at ground level and dumps automatically when lifted. The dragline never lifts the loaded bucket, hence it is capable of handling a scraper of larger capacity than the regular bucket or clamshell.

To dig from a river, deep pit or soft area beyond the reach of the boom, the Crescent is hung from a trolley that rides on a track cable. The cable extends from the boom tip to an anchorage. Digging, hauling and discharge proceed as in the casting operation. Following discharge, the scraper is lifted and gravity-returned to the excavation point by merely tightening the track cable.

Sauerman engineers will quote you on the largest size Crescent Scraper your dragline can handle. Just give us the make, model number and boom length.



Above 2½-cu. yd. Crescent scraper is used on a 1-cu. yd. boom dragline and the yardage rises to 279 cu. yd. per hour. The scraper is taking gravel from a roadside pit and delivering to a movable truck loader.

In this picture a Crescent scraper hangs from a trolley that rides on a slack cable extending from the tip of the boom to an anchorage across the river. Thus, it is able to excavate far beyond the reach of the boom and haul material onto the bank.

Write for Field Report 219, Scrapers with Boom Machines and Catalog J, Scraper Buckets

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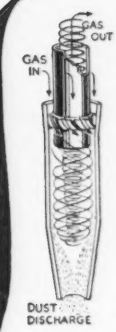
No other mechanical recovery equipment has so many years of dust recovery experience behind it . . . or has such uniformly high collecting efficiency . . . or provides so many other money-saving, space-saving advantages as MULTICLONE. The four advantages outlined below are by no means the complete MULTICLONE story, but are typical of the vital savings found *exclusively* in MULTICLONE equipment . . .



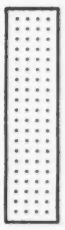
Uniformly High Recovery:

MULTICLONE's multiple *small diameter* tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles, but also a high percentage of the *extremely small* particles of 10 microns and less. This, coupled with the fact that there are no pads or filters to become choked with recovered material, results in a more complete recovery of *all* suspended materials from the gas stream.

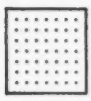
Space-Saving Compactness:

Plant space costs money—so be sure to check space requirements carefully. As shown in the accompanying chart, the MULTICLONE requires less floor space and less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the great importance of this one MULTICLONE advantage alone!

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9



Long and narrow



Square

Maximum Adaptability:

In addition to its unusual compactness, the MULTICLONE is also unusually adaptable to various installation requirements. Where head room is low it can be installed with side-inlet side-outlet connections. Where side clearances are restricted, it can be installed with side-inlet top-outlet connections. In addition, without changing capacities, the shape of the unit can be varied—long and narrow, short and wide, or square—to fit restricted spaces . . . and its single-inlet single-outlet duct requirements permit greater flexibility and simpler installation. These savings slice installation costs, space requirements and insulating expense.

Minimum Maintenance:

The MULTICLONE has no high speed moving parts to repair or replace... no pads or filters to clean or renew... nothing to choke the gas flow or increase draft losses as suspended materials are recovered. MULTICLONE draft losses remain uniformly low *at all times.* Further, the recovered material from an entire bank of tubes is collected in a *single* hopper—far easier to service and maintain than the multiple hoppers of conventional cyclone units.

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This 32 page booklet outlines the basic principles of centrifugal dust recovery and shows the *many* ways MULTICLONE advantages assure higher recovery at lower overall costs. A free copy of this booklet will gladly be sent on request. Write today!

Before you decide on any recovery equipment be sure to get complete information on MULTICLONE advantages. A letter, wire or phone call to our nearest office places this information in your hands without obligation. Get *all* the facts and you will get MULTICLONE Collectors!

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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

OREGON

Powder River Dredging Co. has halted operation of Oregon's only gold dredge and the state's principal gold producer since World War II closure.

The dredge, except for two war years, has been in almost continuous operation for about 20 years working the Sumpter Valley of Baker County.

In those years the dredge has worked over 6500 acres and in recent years has been going over the gravel a third time.

Manager L. A. Skillings reported the shutdown in late August was for "several months" while some employees prospect the valley for likely new ground. The dredge, built in 1913, has a daily capacity of 8000 to 9000 yd and has operated around the clock all year except for two holidays. A normal crew was four men per shift.

Shutdown will further seriously cripple Oregon's gold output, which except for the war years, was in 1953 at its lowest in history at a value reported at $188,000 as compared with a normal $4-million in pre-war years.

Reopening of the Bonanza Mine in Douglas County as the result of rising prices for mercury and stimulated interest in the prospects of other properties as the result of the new government buying program is reported by the Oregon Department of Geology and Mineral Industries.

Bonanza, which suspended in February, is the state's largest producer and management is reported planning further expansions. A crew of 15 is at work. The Gould furnace has been put back into operation and mining resumed on the 370 and higher levels. Access to the 5th to 9th and the 1050 levels was expected by mid-September when water is removed.

Greenhorn Mountain Development Co., Baker, Ore., has taken over the Pyx gold prospect in Grant County, started underground development and has a 25 ton test mill under construction.

The millflow sheet was worked out by the Denver Equipment Co. Ward L. Hill, general manager, reports the sheet calls for jigging and flotation with tabling to be added as work progresses.

Power will be provided for mill and underground lighting by a diesel-electric unit. Present plans call for a 10-man payroll on a one-shift basis. Glen Ingles is mine superintendent; Frank Kolkow, mill superintendent.

Diamond drilling of a deposit of perlite, owned by Northwest Perlite Co., Portland, and located in Malheur County, was completed during July, the first time such exploration of perlite has been undertaken in Oregon.

Work was by Nichols-Thompson Drilling Co., Boise. Total of 361 ft in 12 holes, deepest of which was 48 ft, was drilled with excellent core recovery reported by the owners despite the shell-like fracture of the volcanic glass deposit.

No. 2 furnace is to be fired up this fall at Hanna Nickel Smelting Co.'s new plant at Riddle. The plant began operation July 12, two months ahead of schedule.

The orebody is atop Nickel Mountain at 3550 ft elevation. Mine and plant buildings are lower down. An 8300-ft tramway carries ore down the mountain to the smelter site.

Sixty-four 50-cu-ft-capacity cars deliver 2000 tons of ore each 8-hr shift, moving at 500 fpm.

An interesting feature of the tramway is that, in braking the load, enough power is generated to meet requirements of the entire mine operation. Earl S. Mollard, formerly assistant general manager of M. A. Hanna Co. Minnesota mines, is in charge of both mining and smelter operations at Riddle.

Two Grant County operators, John Day Mining Co. at its Dry Camp property and Burt Hayes and associates at their Haggard and New claims, have been shipping chrome concentrates steadily.

Paul Remaley is building a new concentrator near the forks of Dixie Creek. Earl Lyman and Glenn Findlay and associates, who have leased the Kingsley and other chromite prospects, also are

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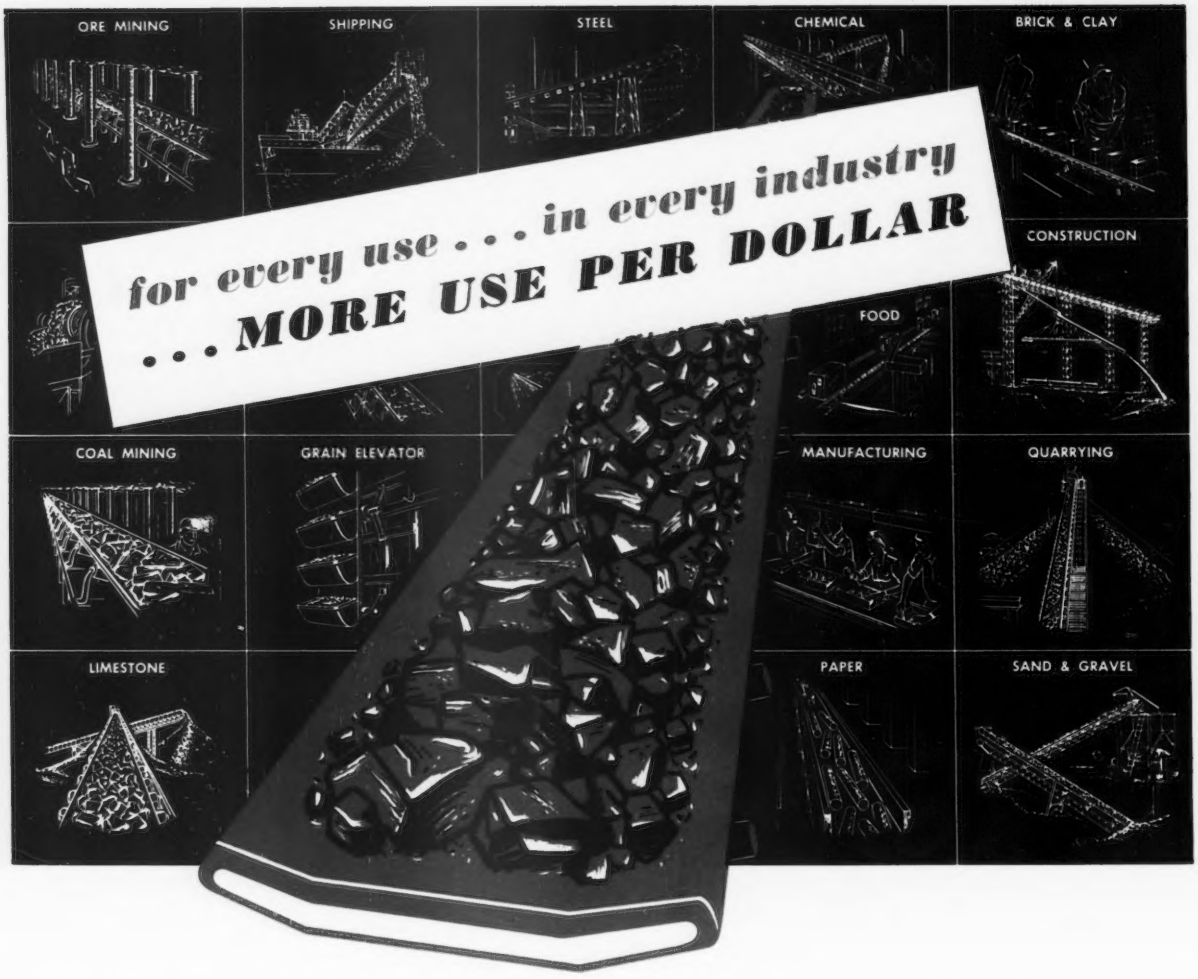

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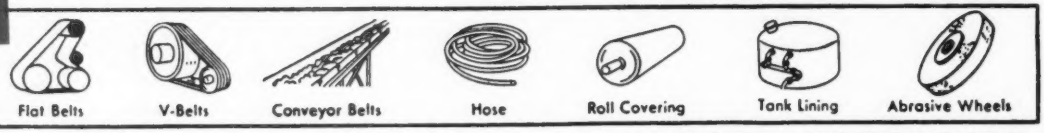

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Oregon (*Continued*)

building a concentrator near the Burt Hayes mill on Dog Creek.

Greenhorn Mountain Development Co. is constructing a 25-ton test mill at the Pyx Mine gold prospect in Grant County. Mill flowsheet will include jigging and flotation. Tabling is to be added later.

A diesel-electric unit is to be used for power and lighting. The company plans to employ 10 men.

Work is in progress on the 370 and higher levels at the Bonanza quicksilver mine, which last year was the state's largest mercury producer. Operations had been shut down at Bonanza but were reopened June 1.

It was expected that unwatering soon would allow work to be started on the 5, 6, 7, 8 and 1050 levels. Some 15 men were employed early last month. Plans include stepping up production to take advantage of the current record price for mercury. Oregon's 1953 mercury output amounted to 648 flasks.

Mining of shipping-grade copper by Ray Summers has been resumed at Standard Mine in Grant County. Surface exploration was carried out early this year.

Core drilling was underway last month at the Turner-Albright Mine in Josephine County. Granby Consolidated Co. of Canada, which has leased the property, has been repairing old adits and doing surface work.

Dark Star, new chrome prospect in Josephine County near the Chrome King Mine, is being developed by a trio of Cave Junction miners. They are linking their prospect by road with Chrome King Mine.

PENNSYLVANIA

Limited exploration operations are continuing at the first uranium mine in the eastern United States (see *E&MJ*, September 1954, p 176). The deposit, at Jim Thorpe (formerly Mauch Chunk), Pa., is being explored by The Lehigh Coal & Navigation Co.

After an extensive core drilling program to obtain information on the location and extent of the deposit, Lehigh has just recently removed 400 tons of ore in further exploration.

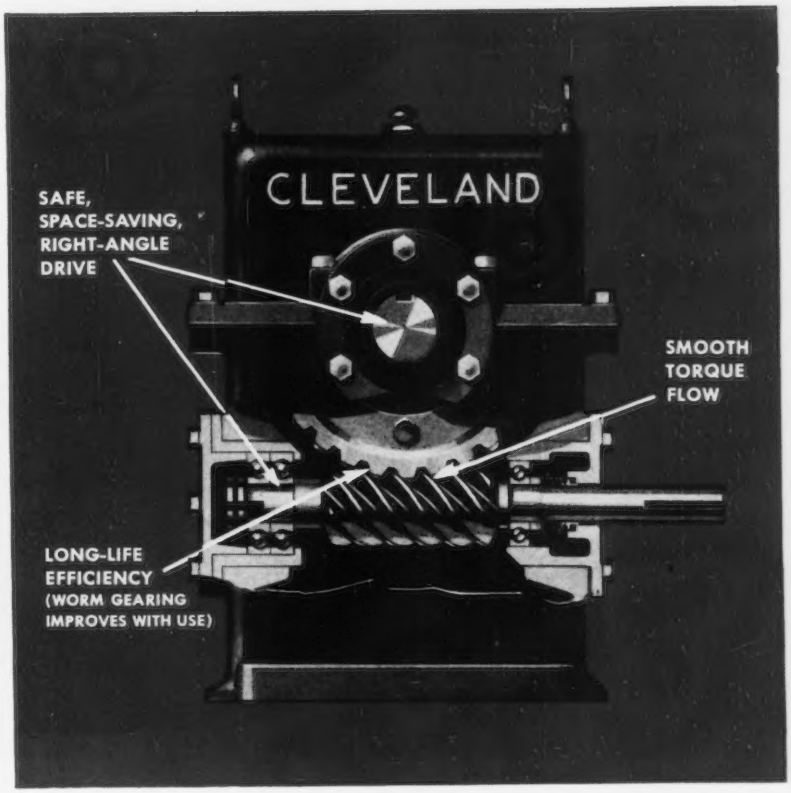
Tunneling operations have been undertaken to determine through bulk sampling the extent of the one major orebody located thus far. Initial analysis is reported to have indicated average grade of 0.20% U_3O_8 with a relatively high lime content.

Lehigh is continuing efforts to determine extent of uranium reserves. The ore is being stockpiled by the Atomic Energy Commission at present.

UTAH

Vanadium Corporation of America has

Why WORM gear?



Cutaway shows compact interior design and construction of a typical Cleveland worm gear speed reducer.

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HERE are some of the inside reasons why Cleveland worm gear speed reducers are specified by many of the leading builders and users of industrial machinery.

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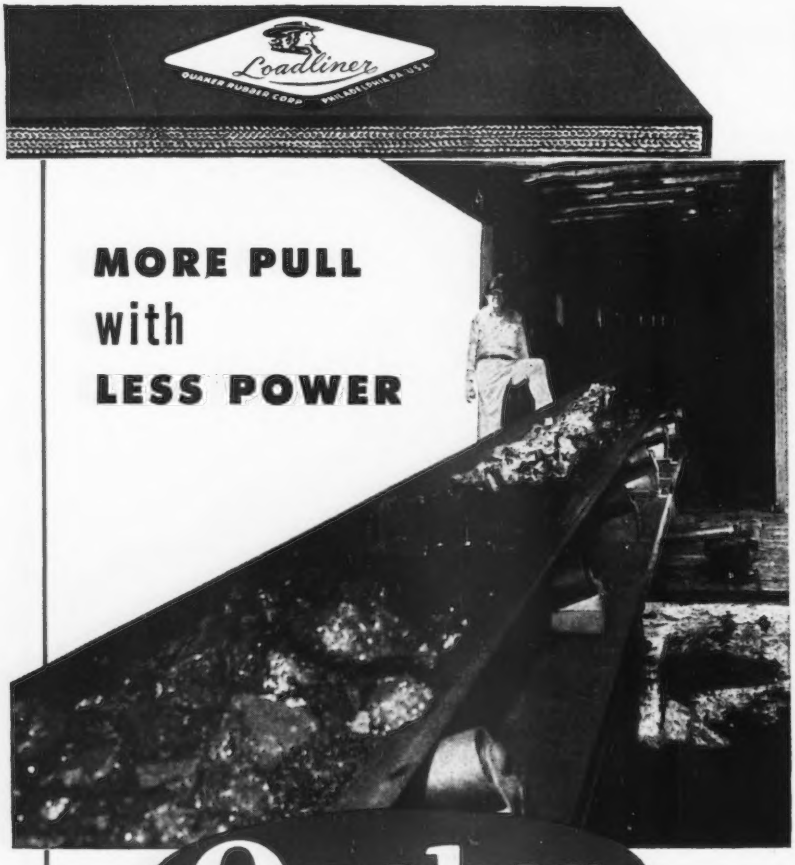

Quaker

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two drill rigs at work on a block of leased land at Summit Point, San Juan County, with another rig to be moved in shortly. Plans call for 800 ft drill depth. The land is leased from Lawrence Callihan, W. and R. Kuykendall, Grady Ragsdale and Eldon Leffell and Robert Jones.

Joseph W. Frazer, president of Standard Uranium Corp., New York, expects production from the firm's Moab District uranium mines in November. The goal is 500 tons daily by Jan. 1, and 1000 tons daily by late spring, according to the auto magnate. Standard is completing a 1000 ft tunnel into the main orebody, with miners working on a two-shift basis, he added.

American Sulphur & Refining Co. of Beverly Hills, Cal. has reported plans for erection of a $500,000 mill at Sulphurdale, where the company leases properties from George F. Kremm of Chicago.

The company has options to purchase the sulphur properties for $600,000. Diamond drilling is said to have disclosed proved reserves of 3-million tons of 25% sulphur-bearing rock.

Lucky D Uranium Mining Co. reported shipment of 4150 tons of dry ore from its Sandy and Yellow John claims at Fry Point, in the White Canyon Mining District of San Juan County. Wade A. Dillon of Cortez, Colo., is president of the company.

The claims are mined from a series of large pits and short adits along the outcrop of Shinarump sandstone, and have exposed an ore outcrop about 300 ft long with ore thickness of up to 10 ft.

Jay W. Jacobson, president of Congo Uranium Co., said that his company is sinking a shaft on its Dream group of seven claims in Garfield county, near Notum. Negotiations for drilling on the Glen group and Irene group also are under way.

A cut sample in the Dream shaft, Jacobson said, analyzed good uranium and vanadium values.

Reported discovery of a large vein of uranium ore by an oil company drilling in the Cedar Mountain-Buckhorn area of Emery county led to 1,100 claim filings in three days at the county recorder's office in Castle Dale. Signing of Public Law 585, permitting uranium mining on oil and gas property, also played a part in the rush.

WASHINGTON

Installation of a 75 kw diesel generator at the Germania tungsten mine in southwestern Stevens County, will allow 24-hour operation. The company expects to ship its first concentrates soon from an open pit operation.

The Germania property is being operated by Penticton Tungsten Mines, Ltd., under the direction of Lloyd H. McKay, general manager, a milling and mining engineer from Skeena Crossing, British Columbia.

"Scramming" on the Mesabi

INTERNATIONAL TD-14A puts speed and power into one of the first operations of its kind in the east end of Mesabi Range. Lenci & Politano took the "scramming" contract for the removal of small pockets and deposits of ore remaining after the big equipment had been taken away. They report the little crawler was just right for the close quarters and heavy going.

INTERNATIONAL Crawler makes a big impression on east end of the Range

What's "scramming?" It's cleaning up the small pockets and deposits of ore that remain after main ore body has been worked. It is a job that brings out the special abilities of smaller crawlers in the complete INTERNATIONAL line according to Lenci & Politano, "scramming" contractors in the east end of Mesabi Range.

An INTERNATIONAL TD-14A was used in the operation. Operator Leonard Lehman, who had always handled big crawlers before, has this to say:

"The way that tractor can get around in tight corners and the size of the load it can handle were things I had not expected. It showed me there is a place for the smaller INTERNATIONAL crawler even in such a big operation as mining the Mesabi Range!"

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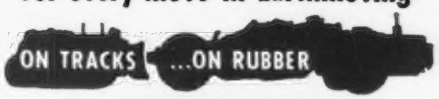

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Washington *(Continued)*

A Spokane mining engineer, Percy Gardner, who visited the mine recently, reported that a Geiger counter indicated the presence of "appreciable amounts of uranium" in wolframite tungsten concentrates.

Scheel Olivine Inc., of Mount Vernon, has started production of olivine at its property at Hamilton on the southern slope of Twin Sisters Mountains.

The ore is treated at the company's newly-completed crushing plant at Hamilton. Many uses have been found for the mineral by research workers from the University of Washington at Seattle. They are said to range from foundry sand to fire brick. The deposits, according to H. P. Scheel, president, are the largest in the world.

Penticton Tungsten Mines Ltd., has installed an additional 75-kw diesel generator at the Germania Mine in Stevens County. Plans are for operation around-the-clock. Shipments from open pit mining were expected to start soon.

Goldfield Consolidated Mines Co., which shut down the mill near Aladdin in Stevens County last fall due to low zinc-lead prices, has resumed operations on a 1-shift basis.

WYOMING

One hundred tons of uranium ore, mined at night with the use of ultraviolet light, has been stockpiled at the Gunnel claims in the Gas Hills area of eastern Fremont County.

Otto Trefsgar, manager of the Sateco Uranium Co. which has leased the claims from the Fremont Metal & Mining Co. of Lander, said prospectors discovered that an adjacent rock, barren of uranium, was as radioactive as the uranium ore.

A test shipment of 17 tons of ore from the Gunnel claims was sent to the Climax Uranium Co. in Colorado for an amenability test, to determine whether the milling process at the Grand Junction AEC station was suited to that type of ore.

Norbute Corp. announced it will begin uranium exploration and development on 23,000 acres of state leases in Carbon, Fremont, Sweetwater and Sublette Counties. The company, an early producer of copper at Butte, Mont., said it also has 150 claims under option in Grand and San Juan counties in Utah.

Lucky MC Uranium Corp. shipped 250 tons of uranium ore from its claims in the Gas Hills area to the AEC buying station at Edgemont, S.D.

The shipment was the largest to date from Fremont County. W. H. H. Cranmer, president of Lucky MC, said that if the shipment is assayed as commercial grade, at least 150,000 tons of similar ore will come out of the company's claims.

Empire Corp., formerly active solely in oil development, has acquired 6500 acres of state uranium leases in Wyoming. Empire also has 160 acres of state leases in San Miguel County, Colorado, and has been negotiating for leases on more than 50 claims in Utah.

IN CANADA

ONTARIO

Developments are proceeding in lively fashion in the Bancroft area, where uranium is now the chief mineral of interest.

One of the most advanced properties is that of Centre Lake Uranium Mines, with two levels established. On the adit level volume works out to 2700 tons per vertical ft averaging 0.09% U_3O_8, although only a small part of the zone length has been explored.

First work on the second level, opened from the shaft 125 ft below the adit, has been showing similar results. The area is some 150 mi northeast of Toronto.

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Ontario (*Continued*)

Faraday Uranium Mines, neighbor of Centre Lake, is just going underground, with plans to drive two adits from which at least 4000 ft of lateral work will be done.

Surface drilling has indicated a length of 4700 ft averaging 0.0797% U_3O_8 across 13.4 ft. The tonnage is contained in seven shoots in a zone length of 2700 ft.

Also in the area is Croft Uranium Mines, subsidiary of Macassa Mines, with extensive drilling completed, as well as 1000 ft of adit drifting. Results look like 1-million tons that will average between 0.08 and 0.09% U_3O_8 to a depth of 650 ft. Next step in development probably will be shaft sinking, but in the meantime surface drilling is being continued.

Shaft sinking is planned, too, by Dyno Mines, another Bancroft prospect. A three-compartment vertical shaft will be sunk to 400 ft, to open levels at 150, 250, and 350 ft. Estimated volume of the main zone, established by drilling, is 505,000 tons averaging 0.085% U_3O_8.

Other less advanced prospects in the Bancroft area include Jesko Uranium Mines, exploring a 3000 ft dike that shows promising radio-activity; Homer Yellowknife Mines, with drilling started on a showing traced on surface for 2500 ft.; and Aubelle Mines, doing surface exploration on two claim groups.

Most advanced operator in the Bancroft district, however, is Cardiff Uranium Mines. Under development for some years as a fluorspar prospect, the Cardiff property near the town of Wilberforce has attracted new interest on account of its uranium possibilities. The shaft and workings, idle since 1951, are being unwatered, and a 125-ton concentrator is being installed. Plans are to produce a uranium oxide concentrate for shipment to the Eldorado refinery at Port Hope, Ont., stockpiling the fluorspar for treatment later. First production is scheduled for early 1955.

Bethlehem Mines Corp., wholly-owned by Bethlehem Steel, expects to make first shipments by year-end from its big open pit magnetite mine at Marmora, Eastern Ont.

Operations are geared to treat 4000 tons of ore daily, the product to be 1500 tons of high grade iron pellets. Production will be shipped by rail to Picton on Lake Ontario, where storage bins and loading dock have been installed, and will be taken by boat from that point to the Bethlehem plant at Tonawanda, N.Y.

Enough ore has been outlined at the mine to support the project for at least 20 yr.

It looks as though a second mine is being developed in the Manitouwadge area, drilling results at Willroy Mines having started to click in promising fashion.

The company has been drilling since last winter along the favorable structure that strikes in from the adjoining Geco ground, and has found what appears to be an important zinc-silver orebody.

A length of more than 800 ft is indicated, wide open to the west. Best hole to date showed 82 ft averaging 6.4% zinc and 6.4 oz. of silver per ton.

In the meantime, Geco Mines has suspended surface drilling and is concentrating on townsite and mine construction. No tonnage estimate has been issued by the company, but it is known that deep drilling has continued to enlarge the ore picture. Latest results included the deepest section encountered, 40 ft averaging 1.48% copper, 3.58% zinc, and 2.29 oz. of silver at a depth of 1200 ft.; and also the widest, 240 ft averaging 2.27% copper, 1.20% zinc, and 1.16 oz. of silver.

A third property in Manitouwadge to return interesting results is that of Nama Creek Mines, northwest of Willroy. This company, one of the M. J. Boylen group, has been drilling for several months on a zone that shows persistent and strong mineralization. Shallow holes have shown values in copper-zinc ranging from marginal to less than ore grade, and a deeper tier is now being put down.

Newest development in the camp, however, is the acquisition by The Teck-

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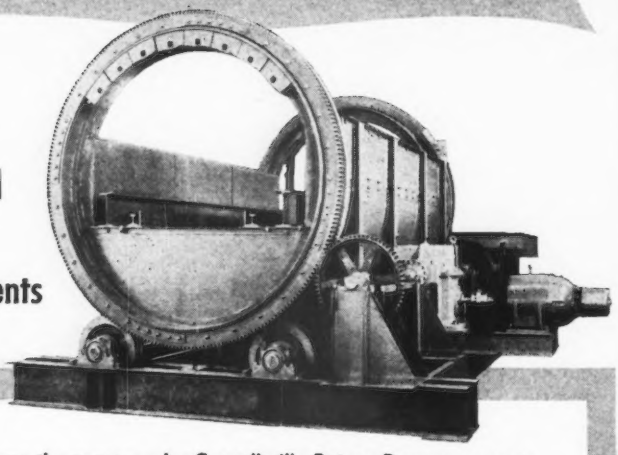

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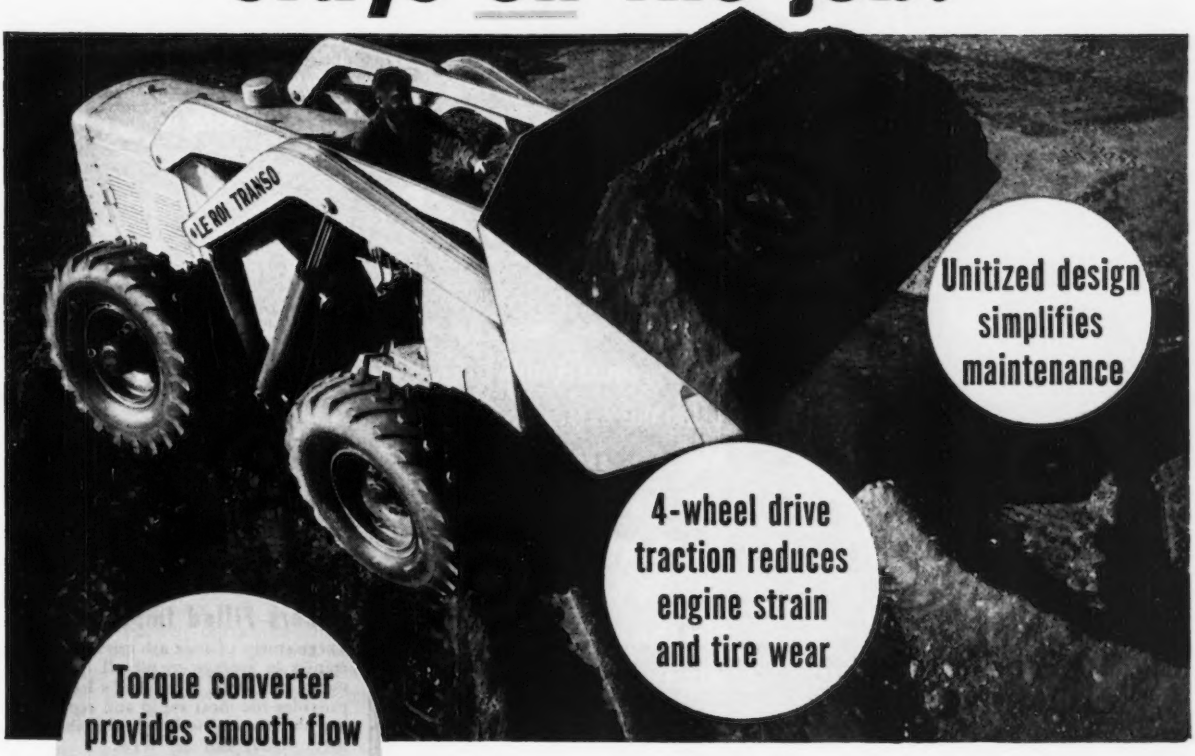
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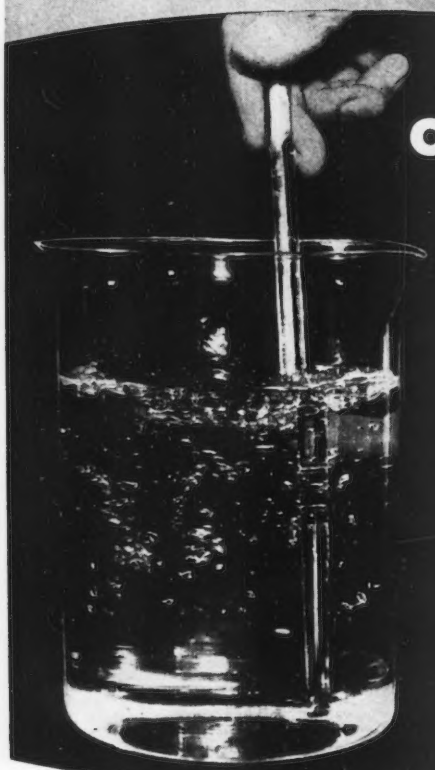

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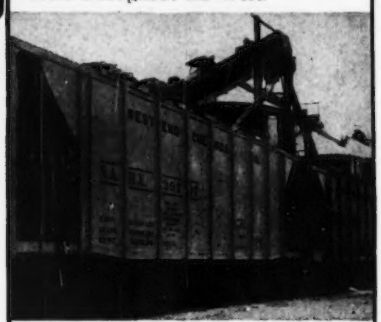

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Ontario *(Continued)*

Hughes Gold Mines of the 49 claims held by Consolidated Howey Mines adjoining Geco and Willroy on the south.

Regarded from geophysical work as an excellent prospect, the property will be given a thorough test by Teck, which is well fortified with funds. As well as receiving a vendor interest in the operating company, Consolidated Howey will benefit through its large holding of Teck stock, reported unofficially to make it one of that company's largest shareholders. Howey also holds shares of Geco and Willroy.

First project of its kind to be undertaken in Ontario, the shaft being sunk by Canadian Rock Salt Co. near Windsor is about half way to its objective of 1000 ft. Ontario's salt mining, an old industry, has all been done by brining (pumping the salt to surface in solution), but the beds on the company's property are thick enough to make underground mining feasible. It is expected that mining will be started before the end of 1954.

Paymaster Consolidated Mines is just about ready to resume production at its Porcupine area gold mine where operations were suspended last December due to excessive costs.

Installation of a considerable amount of modern equipment will, it is hoped, permit the renewed operations to show a profit. The mine has at least three years' ore supply assured, with good prospects of developing new tonnages at depth.

Newest property to receive attention in the Blind River uranium area is that of Buckles Algona Uranium Mines, adjoining the Nordic Lake group of Algom Uranium Mines.

The property consists of 66 claims, and the strike of the favorable contact has been indicated for a length of 4100 ft. First drilling gave confirmation, showing two sections of conglomerate beds similar to those being developed on the Algom ground.

Two mineralized zones carrying values in nickel and copper have been indicated by drilling on the Flack Lake property of Talvey Metal Mines, located in Twp. 157, about 8 mi north of Algom in the Blind River area. Initial results were somewhat below ore grade, but the drilling program has been enlarged.

Two newcomers to the Blind River area are Shakespeare Uranium Mines, diamond drilling on a claim group in Shakespeare Twp., Agnew Lake section; and Macu Mines, with 17 claims in Shedden Twp., where a geiger survey is being completed. Macu also holds 18 claims in the Manitouwadge camp about 8 mi northeast of Geco, on which surface prospecting is being started.

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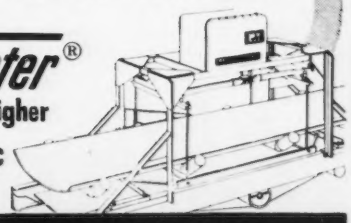

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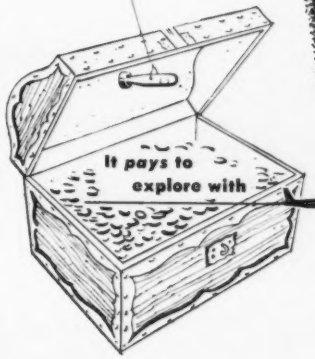

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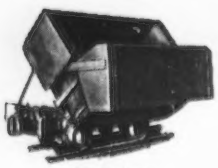

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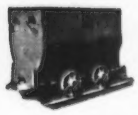

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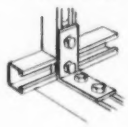

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prospect being developed by Eldrich Mines, the opening having been collared and a contract having been let for construction of the 90-ft headframe.

The opening will be taken down initially to 500 ft. Ore indicated by drilling is estimated at 650,000 tons averaging 0.2 oz gold per ton, with the zone open at both ends.

Deep drilling at the Chibougamau property of Opemiska Copper Mines (Quebec) Ltd., pioneer producer of the area, has indicated a new ore zone south of No. 4. Structure and grade appear to be typical of those on which this new producer is already making good profits.

The mill, now straining its 400-ton capacity rate, will probably be enlarged in preparation for the larger scale of operations which will be possible when railway and power facilities are available next year; meanwhile the shaft is being deepened to open another three levels.

Chibougamau's prospective second copper producer, Campbell Chibougamau Mines, is making good progress in construction of its 1750-ton mill.

Start of production is scheduled for next May, and all phases of the project are up to schedule. It is, in fact, possible that milling will start a month or two ahead of that date.

In the meantime, with the mine just about ready for production, underground attention is being turned toward exploration and development of known favorable areas which so far have been left on the sidelines.

The third mine in the area to join production ranks will likely be that of Chibougamau Explorers Ltd. Decision has been made to build a 500-ton mill, the funds to be provided by Anacon Lead Mines, which holds controlling interest. It is expected that mill buildings will be closed in before the start of winter, and that production will be initiated in the opening half of 1955.

The mill decision was made after results of the first work were observed on the five new levels which have been under development since early summer. Deepest of these is at 1200 ft. Latest ore estimate, calculated to a depth of 750 ft, showed 561,369 tons averaging 0.29 oz gold per ton plus 0.73% copper.

Parbec Mines has taken a 50% interest in financing a lithium prospect adjoining north of the property being developed by Quebec Lithium Corp. in the LaCorne area.

A new company, Canadian Lithium Co., is being formed to undertake the work, which is starting as a cross-sectional diamond drilling program on the eastern section of the 4500-acre group. The area's favorable contact is known to strike across the property in this location.

Operations are rolling along smoothly toward production at the property of Gaspe Copper Mines, big Noranda subsidiary in the new Gaspe area.

The concentrator is almost certain to start working by year-end, and possibly by November, though only half of its 6000-ton capacity may be used initially.

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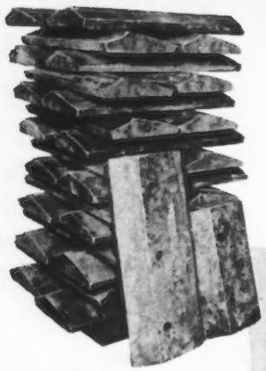
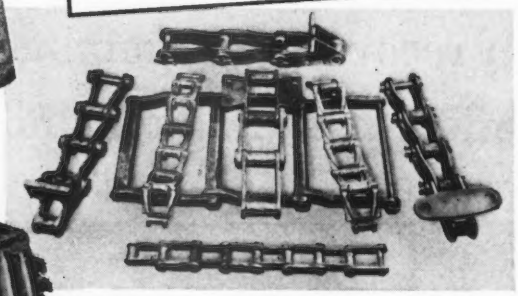


Ball Mill Liners



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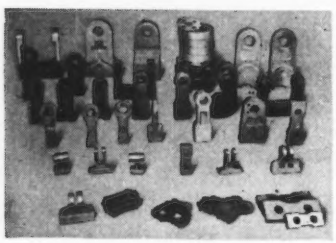

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Quebec (*Continued*)

The smelter is scheduled to start a few months later. In the meantime, underground work has confirmed the grade estimates made from drilling, and there is a possibility that average may work out fractionally above the 1.3% copper that was calculated for the indicated 67-million tons.

Production plans have been changed by Noranda Mines and Macdonald Mines for their jointly owned West Macdonald property in the Noranda area.

Last winter it was decided that Noranda would build a 1500-ton mill and treat the West Macdonald zinc-pyrite ore on a custom basis.

Instead the mill of Waite Amulet Mines, in the same area, is to be enlarged to capacity of 2000 tons to treat 1000 tons of West Macdonald ore.

The change will mean that West Macdonald will reach production at a date considerably earlier than previously planned, with a corresponding advance in the date at which Macdonald can expect to receive benefits. It will also mean that Waite Amulet will be able to cut production back to 1000 tons daily without the handicap of larger unit costs.

Plans for shaft deepening are being made by Weedon Pyrite & Copper Corp. 40 mi northeast of Sherbrooke in the Eastern Townships. Three new levels will be opened, deepest to be the 14th. In the meantime the mill continues to treat 300 tons daily, producing both copper and pyrite concentrates.

Yates Uranium Mines is diamond drilling its 7-claim uranium prospect in Huddersfield Twp., 54 mi northwest of Ottawa. Two zones have been indicated with length of 1500 ft carrying widths of radioactive crystalline limestone from 20 to 100 ft.

Shaft deepening from the third to the fourth (600-ft) level is just about completed at the property of Eastern Metals Corp. 65 mi southeast of Quebec City.

SASKATCHEWAN

Iso Uranium Co. Ltd., reportedly is prepared to spend a minimum $500,000 on drilling operations at a newly acquired property in the Athabasca area.

The property is on Laird Island in Tazin Lake, 20 mi north of Uranium City, and already has been cleared for about 200 sq ft.

Considerable importance also has been attached to plans announced by New Mylamaque Exploration, Ltd., for underground exploration and development of its Laird Island property. The Iso and New Mylamaque properties were said to have the same structure.

Transcontinental Resources Ltd., reportedly is reopening the Nicholson Mine at Uranium City and sale of ore is said to have been arranged with Eldorado. Transcontinental also has started a pro-

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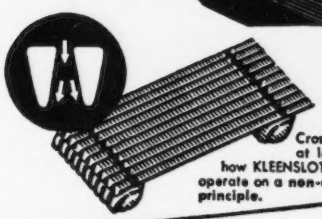

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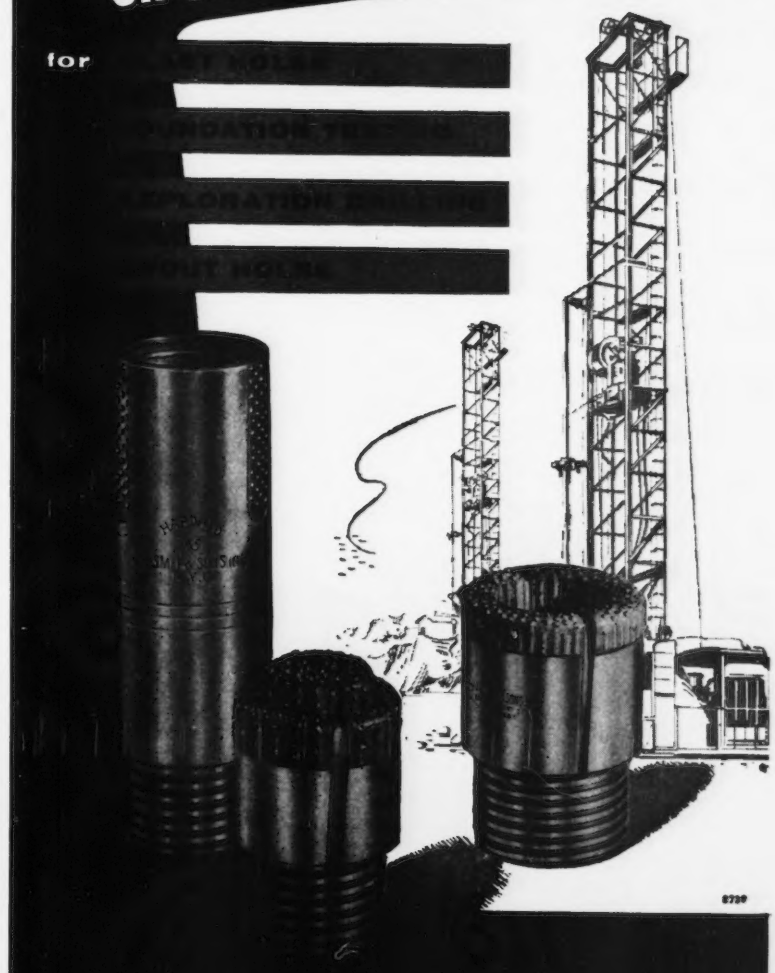

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Saskatchewan (*Continued*)

gram of exploration at the Ridley Mine on the Southeast shore of Great Slave Lake.

La Ronge Uranium Mines has announced it will experiment with a new type of uranium processing at a pilot plant recently placed in operation near Nistowiak Falls, 170 mi north of Prince Albert.

NOVA SCOTIA

Signs of a major tonnage zinc deposit are in evidence on the Meat Cove section of the big reservation held by Mineral Exploration Corp. on Cape Breton Island.

Meat Cove is close to the northern tip of the island. Found through an anomaly disclosed by an airborne geophysical survey, the deposit appears to have possibilities as an open pit project with grade running 3% zinc over big widths. Already under test by extensive trenching, the showing will be explored underground by means of an adit.

A geochemical survey is being made by King Copper Corp. on its property in the Oxford area, following surface work that disclosed copper values in a typical sedimentary deposit.

NEW BRUNSWICK

Staking rushes for uranium have developed in two sections of the Province; southwest of Fredericton and south of Campbellton. In the former area a large amount of staking has been done in the York Mills sector along a 12-mile belt.

Biggest parcel of ground has been secured by the J. H. Hirshhorn interests of Toronto, with other companies to show early foot including Nipiron Mines, Conwest Exploration, Preston East Dome Mines, and Selco Explorations Ltd.

In the Campbellton area, close to the Quebec border, the rush has been concentrated along the Upsalquitch River, with hundreds of claims reported staked.

IN LATIN AMERICA

MEXICO

Mexican mining circles received with natural relief the news that President Eisenhower has rejected the U. S. Tariff Commission recommendation that tariffs be raised on lead and zinc ore and ingots.

It had been widely predicted in Mexico that such a tariff might force the closing of Mexican mines employing 70,000 persons as well as affecting mining of other minerals mined with lead and zinc.

News of the rejection received front-page headlines in all the Mexican press and was the subject of eulogistic editorials warmly praising the United States for its action.

Senator Alberto Terrones Benitez, president of the Mexican Senate Mining Commission, said the decision could only be considered a "temporary palliative" and that the mining industries problems are by no means resolved by this decision. Mexico's mining industry is still seriously hindered with heavy taxation, increasing production costs and generally low world market prices.

Senator Terrones took the occasion to make a detailed analysis of the Mexican mining situation. He said:

"The case of the so-called Simpson bill and other measures to erect barriers against foreign imports of lead and zinc demonstrates once again the necessity of studying, analyzing and resolving the profound problems which affect the Mexican mining industry with regard to international markets . . .

"Arguments in favor of protectionist tariffs are varied and even understandable, but they are without economic significance from the moment in which they fail to satisfy the greatest number of human necessities at the least possible cost.

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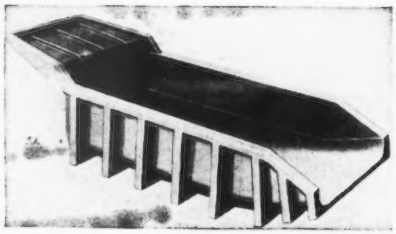

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BH-42M

Mexico *(Continued)*

ulating the distinguished North American statesman. We must learn from the hard lesson taught us for the umpteenth time. An economic policy which consists in waiting for the solution of mining problems through unilateral decisions from abroad must always be tied to economic dependency.

"In Mexico, there are at least three principal views with regard to mineral production. The first bases improvements in private mining for exclusive use abroad. The second advocates decrease and even paralyzation in the hope it may someday be used by the international proletariat. The third seeks a rational exploitation to achieve the industrialization of the country and the stabilization of the Mexican mining economy."

"In this country," Senator Terrones continued, "production of lead, zinc and copper is tied to the production of gold and silver as well as elements such as sulphur, arsenic, bismuth, molybdenum, and selenium.

"It is evident therefore what a serious impact any slump in the lead and zinc market would have on our mining industry. Hence it is urgent that we eliminate the dependence of mining and metallurgical activities on exports to foreign countries."

Mexico's Mineral Development Commission, which started three years ago to renew operations in the old mining district of El Triumfo, near La Paz, in Baja California, has revealed that it has succeeded in placing operations on a profitable basis and has turned the mining operation over to private interests who have organized a new company, Cia. Minera La Perla S. A. The group of mines involved produce gold, silver and lead. It had formerly been abandoned as unprofitable.

The first blister copper is coming from the re-organized former property of Cia. Minera El Boleo S. A., whose French owners suspended operations a year ago.

El Boleo quit after 80 yr of operation because if found work no longer profitable. A new firm, Cia. Minera de Santa Rosalia S. A. was organized as a mixed capital firm with both private interests and the federal government participating to setup a working capital of two-million pesos (about $160,000). It is the first such mixed capital mining venture in which the federal government has participated, according to the Fomento de Minera.

The government was anxious to see the mine continue in operation as it was the sole livelihood of the small town of Santa Rosalia. It also wishes to up output of blister copper for national consumption.

A large number of claims to flourite deposits have been filed in the central Mexican state of San Luis Potosi, but no confirmation has been forthcoming so far as to the exact nature of the deposits. The government mineral development commission now has sent an investigator to check on the sites.

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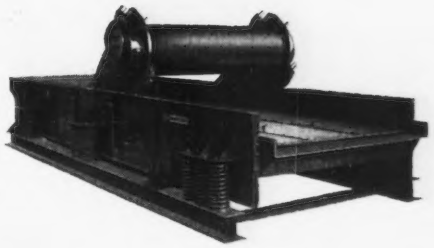
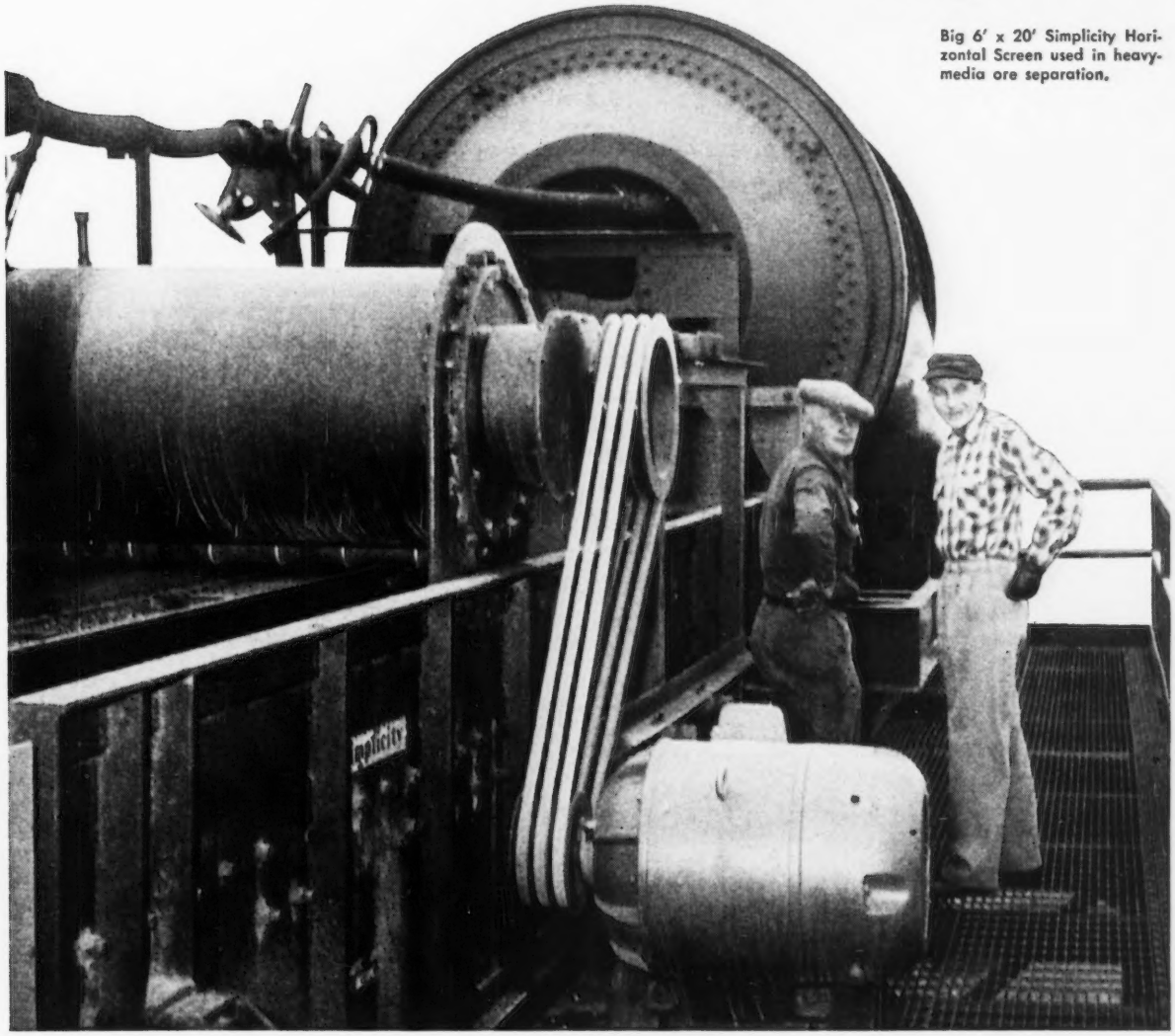


Big 6′ x 20′ Simplicity Horizontal Screen used in heavy-media ore separation.



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Robert H. Ramsey, Editor
ENGINEERING & MINING JOURNAL

Mexico *(Continued)*

The Ministry of National Economy reports the filing of claims to cobalt deposits near Villa de Guadalupe in the state of San Luis Potosi.

According to reports in the Mexican press, a number of prospectors are searching for uranium ore in the states of Oaxaca, Guerrero and Chihuahua, and the Mexican government has issued a reminder that all uranium discovered becomes the property of the federal government and troops will be employed to seize any findings.

ARGENTINA

A new manganese deposit is being mined in Juyjuy Province, 15 mi from the town of La Quiaca, near the Bolivian border. High-grade ore is hand-picked then shipped by Lopez Hermanos Co. to the steel mills of Altos Hornos de Palpalá (Fabricaciones Militares).

Pig iron production at Palpalá was expanded this past summer and the Puesto Viego iron mine, near Zapla, was readied for increased output.

Pan de Azúcar, an old lead mine near Abrapampa, Juyjuy, is being worked again. Current production reportedly includes some 20 tons of silver concentrates a month.

Development work at Campana Mahuida, lead mine at the border of Rio Agrio in the Territorio Nacional de Neuquen, reportedly has shown enough ore to warrant construction of a concentrator.

Samples have been sent to West Germany for testing and estimates on concentrator construction. Ore contains oxidized and sulphide minerals.

Direccion Nacional de Mineria will sink a new 450-ft shaft in developing Farellón Negro, a gold and manganese deposit in Catamarca. Testing of the ore in pilot plant scale is to begin around December.

BOLIVIA

Partial results released recently of a United States-Bolivian government sponsored survey show four areas wherein radioactive minerals are localized.

Uranium compounds were indicated with tin minerals at the Llallagua Mines, of the Catavi group, controlled by Corporación Minera de Bolivia; with wolfram minerals at Tasna, of the Quechisla mining group in southern Bolivia; with manganese and copper minerals at Chulchucani, near the city of Potosí, and with nickeliferous ores at Tapacarí, Province of Cochabamba. Grade of the uranium finds was not disclosed.

The above information was released by Carlos Camargo Blacutt, president of the Bolivian-United States Joint Commission for Radioactive Minerals. In addition to Engineer Blacutt, other Commission members include:

Col. Clemente Inofuentes, Director de Planificatión y Estudios del Ejército,

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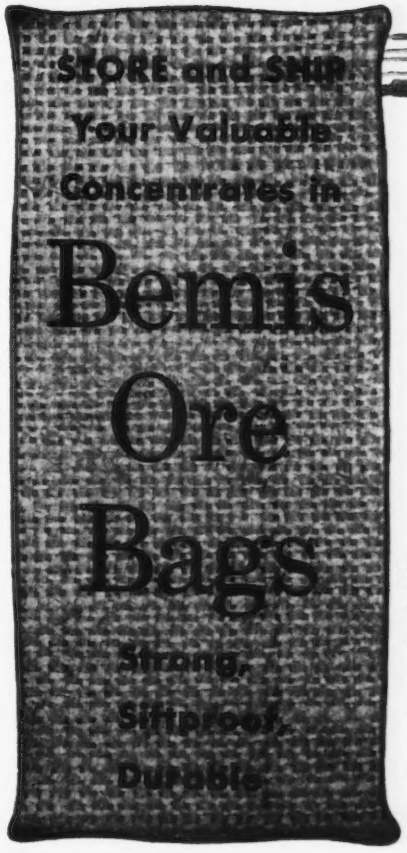

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Russell Honea, engineer, U. S. Atomic Energy Commission;

James G. Henderson, engineer, U. S. Atomic Energy Commission;

Gustavo Donoso, associate engineer;

Capt. Lucio Peña, associate engineer.

In addition, the late Hugo Salmón Tapia represented the Banco Minero de Bolivia on the Commission until his death last July.

Blacutt said that almost the total areas of the Altiplano and the East Cordillera of Los Anges have been carefully surveyed. He disclosed also that preliminary aerial surveys of the Nuflo Chávez and Velasco Provinces, Department of Santa Cruz, have indicated the presence of radioactive minerals. Careful examination of these and other areas is planned.

BRAZIL

Uranite is being mined near Icó in the State of Ceará. The Federal government maintains a special expert at Fortaleza, state capital, who has advised the Mineral Research Service of the National Department for Mineral Production that the uranium ore is high-grade.

Existence of manganese deposits in the River Fresco (upper River Xingú) is to be investigated by the National Mineral Production Department. Samples described as "excellent" have been received by the Department.

The area is difficult to reach and problems of communication are formidable. The Department is said to be aware also that manganese deposits are to be found in the River Aripuaña, Sucumburí and Tapajós areas, in the frontier regions of the States of Para, Amazones and Mato Grosso.

CHILE

Manganesos de Atacama, which has been mining high-grade manganese ores in Coquimbo Province for about 10 yr, is building an electric furnace of 1700 kw capacity near this port to produce high-grade ferromanganese.

The mines are located near the gold camp of Andacollo and are trucked under contract to the Coquimbo port for export. Same company has been developing for some years a large low-grade manganese deposit that will have to be concentrated to bring it up to export grade.

Water in sufficient quantity for concentration has recently been found near the low-grade manganese beds by drilling. Water is scarce in this region.

Cia. Minera Aysen plans to build a second Scotch hearth to smelt the whole of its production of lead concentrates and high-grade lead ores. Slags from the two Scotch hearths will be retreated in a blast furnace. Zinc concentrates produced by the same company are being stocked meanwhile.

The Mining Bank has decided to raise the value of its copper ores and concentrates schedules by giving the miners 100% of the increased value obtained for the blister copper from Paipote. Previously the Bank had decided to increase the copper schedules by 75% of the greater value obtained from the blister, leaving 25% in a special fund to help the development of the small mines.

A German firm, Montan GMBH, has offered to build an electrolytic copper refinery in Chile with an annual capacity of 30,000 metric tons. The firm offers to put up the necessary foreign exchange for imported machinery provided Chile supplies the required pesos for those expenses that are to be incurred in Chilean currency.

Minister for Mines Señor Armando Uribe has made a counter offer asking that Western Germany supply the whole of the funds required for building the refinery.

Borax Consolidated Ltd., whose borate mines are located in the Ascotan Salt Pan in Antofagasta Province at an altitude of 13,000 ft and 120 mi northeast of Chuquicamata, is producing substantial quantities of borate for domestic consumption and export to Brazil and Uruguay.

President of Bolivia Victor Paz Estenssoro, in an interview published in the Chilean press, acknowledged that the Bolivian State is exploiting the mines expropriated from its owners at a loss but that the Government was compelled to keep the mines working because it is the duty of the State to give employment to the miners.

Tin supplies Bolivia with about 80% of its foreign exchange or dollar income. Answering another question, Dr. Estenssoro said that Bolivia had already paid out nearly $3-million as compensation to the former owners of the tin mines.

Romeral, the new iron mine being developed by Bethlehem Chile Iron mines, might start producing at the end of the present year and is scheduled to mine 60% iron ore at the rate of 1-million tons per year.

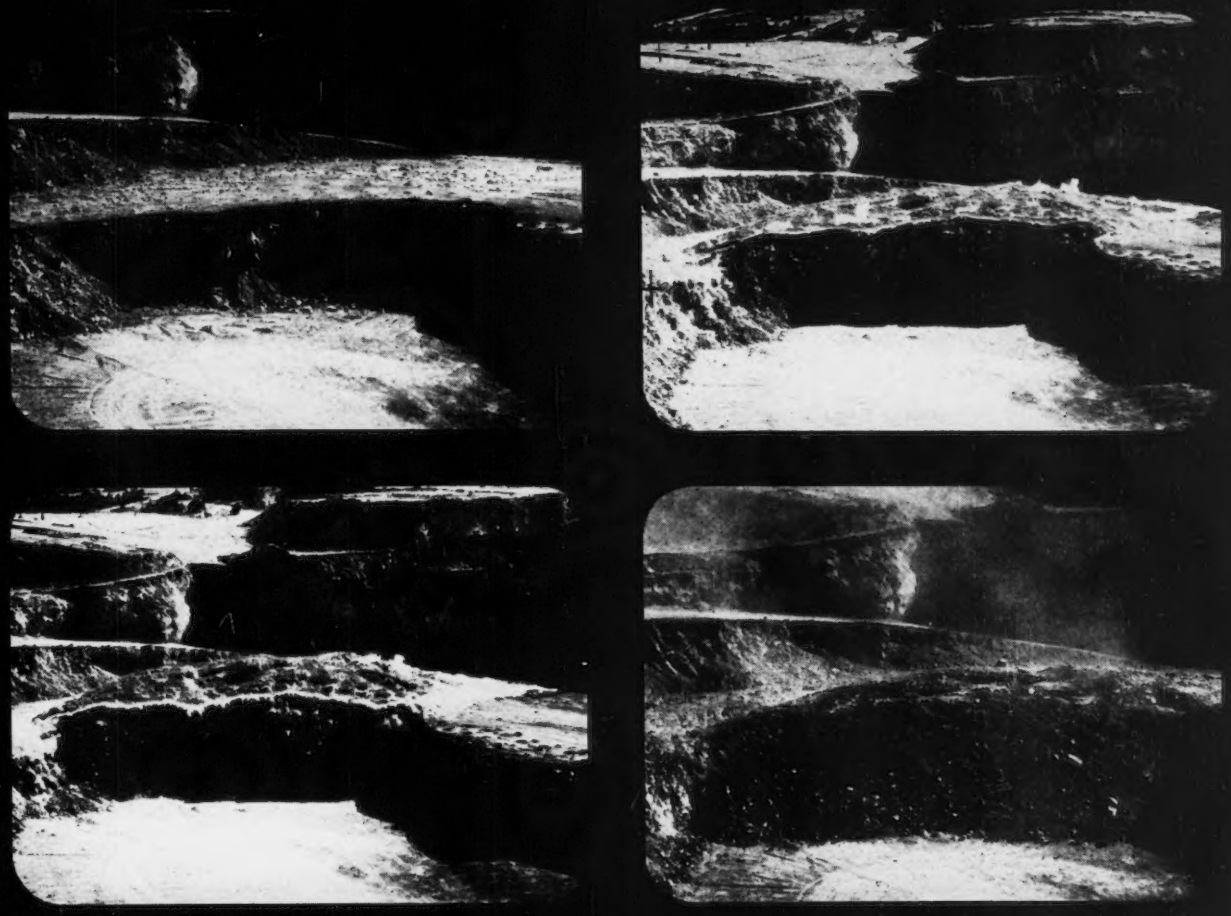
Some 40% of total production will go to the steel mill at Huachipato and the rest will be exported to Sparrows Point.

Compañia Minera de Andacollo has started again milling its gold ores from the Churrumata mine which is the best known mine in the Andacollo gold camp, known before the arrival of the Spaniards to Chile.

Ore is trucked to the mill, which is an all flotation mill, as the gold is found in the pyrite. Andacollo is in Coquimbo Province.

Compañia Minera Condoriaco, which has been a gold-silver, a lead and is now a brimstone producer, some time ago started a small flotation mill and an autoclave plant near the Codocedo sulphur mines to treat the residues from the old sulphur plants, is now trucking its refined brimstone to the port of Caldera, in Atacama Province where the sulphur Codocedo mines and the mill are located.

Compañia Minera Ciclón, formerly a gold



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BLAST DATA:

Number of holes	63
Spacing	16′ x 16′
Height of face	32′
Burden	12′
ROCKMASTER delays	0, 2 and 4
Weight of explosives (Flodyn® 60%)	10,000 lb.
Rock produced	19,000 cu.yd.

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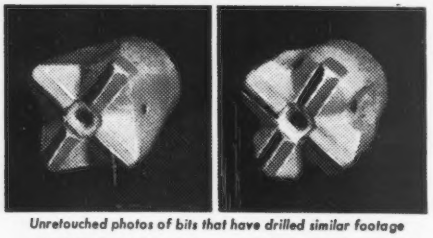

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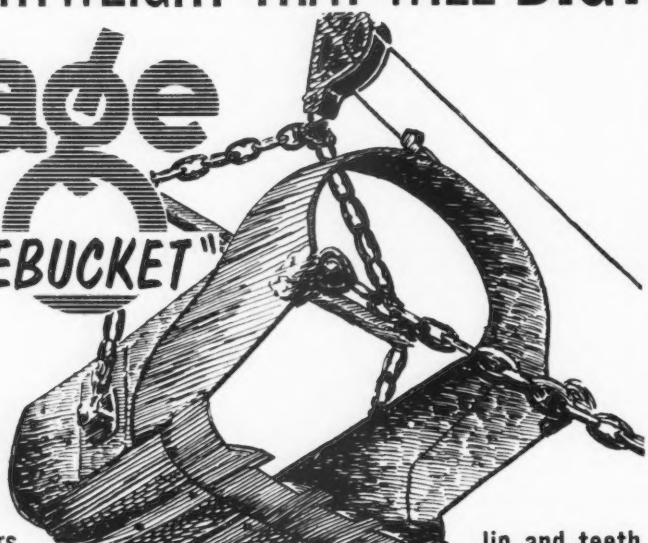

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Chile *(Continued)*

producer in Antofagasta, is now deepening the Atutema shaft of the mine of the same name near Ovalle, Coquimbo Province, previous to starting to exploit its ores. The Atutema mine was, some 25 yr ago, a steady producer of high-grade or direct shipping copper ore.

A United States firm has become interested in the Sagasca copper property near Iquique, Tarapacá Province. Sagasca is a well-known leaching proposition consisting of crysocolla disseminated in a conglomerate and is said to contain 6-million tons of 2.5% copper ore. The U.S. interests reportedly plan to spend $2-million on this mine.

Compañia Minera Tamaya has begun trucking copper fillings from its Tamaya mines to the company's mill at Punitaqui.

Previously the company had been beneficiating the ore from the Tamaya dumps but now the ore will come mostly from the fillings which are higher grade and less oxidized. Both the Tamaya mines and the Punitaqui mill are in the Ovalle Department of Coquimbo Province but the mines are about 40 mi from the mill.

Compañia Minera Aysen has shipped to Santiago its first shipload of pig lead from its mine in the south of Chile. This is the first pig lead produced within the country.

COLOMBIA

Paz de Rio steel plant in the northeastern Department of Boyaca was inaugurated in June. The $100-million plant is to operate during this first year at 80% of its 122,000-ton annual capacity. All steel produced will be consumed in Colombia, which has been importing about 190,000 tons annually.

Iron ore is being obtained from mines at La Mesa, some 21 mi up the valley of Belancito from the plant. There reportedly are 600,000 tons of iron ore available now by open pit mining methods. The deposits have not as yet been fully explored but it is estimated that there is a 26-yr supply. Coal also is found nearby.

Ore will be moved from the mine via a 2000-meter cableway which has a capacity of 150 tph.

PERU

Tangana Mine recently made its first shipment of lead-zinc ore to the Banco Minero concentrator at Huachocolpa. The mine is in the Province of Castrovirreyna, Department of Huancavelica, and is owned by Victor Kravachenko.

Development of the property, which runs about 10% lead and 20% zinc, began in May. More than 1000 meters of mine has been developed and a 10½-mi road has been built.

Production in early September was

(Continued on p 178)

A heaping bucket every time!

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2 Digging in—the torque converter delivers smooth, steady power. Note the tread-marks—no wheel spin

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Hazard Mine Power Feeder Cable conductors are covered with Semicon tape to prevent internal corona cutting. The Keystone high-voltage insulation is resistant to heat, moisture and ozone, giving maximum service life under all conditions. Cable tape on each insulated conductor is colored for permanent identification. Copper shielding tape provides ground fault protection over each conductor, and bare ground wires in contact with the shielding assure low-resistance ground in the event of shielding failure or ground fault in the equipment.

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BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS

Peru (*Cont' from p 174*)

about 50 tons of ore per day but this is being stepped up gradually and output of 100 tons daily is expected by the end of October. Investment to date reportedly is slightly more than US$250,000. Mine superintendent is Tip Croome.

Banco Minero del Peru is nearing completion of a flotation-type concentrator 63 mi east of Lima and 14½ mi from Peru's Central Highway. The concentrator, Planta Huarochiri, is 14,000 ft above sea level.

The plant will treat silver, lead, copper and zinc minerals of the area. It is being built at a cost of US$120,000 and will have a capacity of 70 tons daily. With an additional investment of US$25,000, capacity can be doubled. Machinery was manufactured by the Denver Equipment Co.

The concentrator was being built in its early stages while the approach road was still under construction. The road was completed recently at a cost of US$125,000. Before road completion, some 250 tons of equipment was brought in by jeep and trailer over a very narrow trail. Often the outside wheels were only inches from a 1500-2000 ft drop. The road rises from 10,000 at the railhead at San Mateo to 14,000 ft at the concentrator.

IN AUSTRALIA

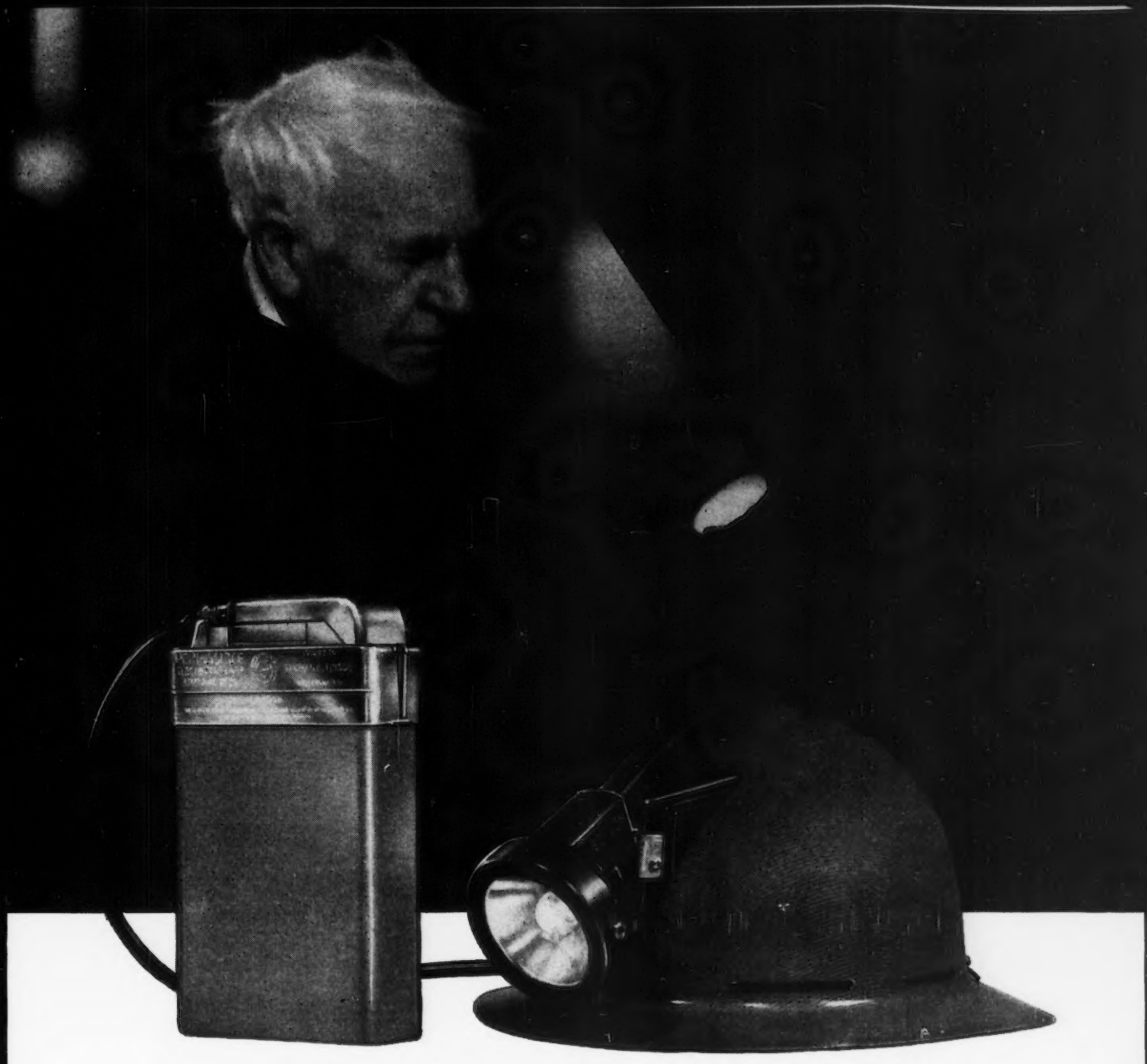
SOUTH AUSTRALIA

In this state uranium has stolen the thunder from all other mineral activities. The state government's uranium mine and concentration plant at Radium Hill, which is said to have cost $11-million to build, was expected to be in production by mid-October. After this, concentrates will have to be stockpiled for some months until the big Port Pirie refinery is ready to process the concentrates to uranium oxide. The refinery's capacity will be much in excess of Radium Hill concentrate production. It will therefore be available for treatment of uranium ore and concentrates from other sources.

The mineralogy of Radium Hill was first described as early as 1916. Uranium occurs here as davidite in a lode of quartz and mica and country rock of hard schist and gneiss. On a pilot-plant scale, the state's Department of Mines has been separating the uranium-bearing davidite by heavy media separation, followed by flotation. This replaced earlier pilot-scale separation by a dry magnetic separator. No information is available about the process actually adopted.

VICTORIA

The state government proposes to control uranium (yet to be discovered in commercial quantities) and to undertake the development of the mineral itself to



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FOR MINERS EVERYWHERE

This month, the nation marks the 75th anniversary of Thomas A. Edison's invention of the first practical incandescent lamp. Giving added luster to this celebration is another of his great inventions . . . the first safe cap lamp for miners. Because his lamp eliminated the principal cause of mine fires and explosions—the open flame lamp—Edison called it his "most humanitarian invention."

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South Australia *(Continued)*

"prevent deposits falling into irresponsible hands, and to preserve national security." This was stated by the Minister for Mines, Mr. Ferguson. He said that Victoria proposed to introduce legislation similar to that operating in South Australia.

TASMANIA

Electrolytic Zinc Co. of Australasia Ltd. reported a record production of 99,201 tons of zinc in the year ended June 30.

Production at the Risdon refinery was 83,501 tons in 1951/52 and 87,356 tons in 1952/53. The West Coast Mines under Electrolytic Zinc management treated 189,437 tons of ore for an output of 8,817 tons of lead concentrate, 52,554 tons of zinc concentrate and 6,216 tons of copper concentrate. With the exception of lead, the figures set new postwar records.

QUEENSLAND

The management of Mt. Isa Mines, big American-Australian copper producer, says it must be close down the mine unless something is done to improve railroad and port facilities. It needs these to obtain raw materials and to get its products to market.

The congestion at Townsville, Mt. Isa's shipping port, is so bad that at times two trainloads of metal are awaiting a loading opportunity at Chartres Towers, a rail point. Similarly the mine is starved for coal and limestone. Sometimes it is down to a few weeks' supply with no new shipments in sight.

In a much publicized deal, the Mary Kathleen uranium leases near Mt. Isa were bought by Australasia Oil Exploration Ltd.

J. E. Ridgway, Australasia Oil geologist, is credited with the estimate that the square mile field contains 1,350,000 tons of high grade ore, subject, of course, to confirmation by systematic drilling and sampling.

IN ASIA

JAPAN

A process for titanium refining with metal calcium has been developed by the Japan Metallic Titanium Manufacturing Corp. of Tokyo.

This process yields metal titanium powder of 300-400 mesh through direct deoxidization of titanium dioxide with metal calcium instead of titanium sponge with magnesium in the case of Kroll process, and according to Managing Director Makoto Okubo is unique. The powder thus obtained can be exported at $6.50 per pound cif U.S. Its produc-

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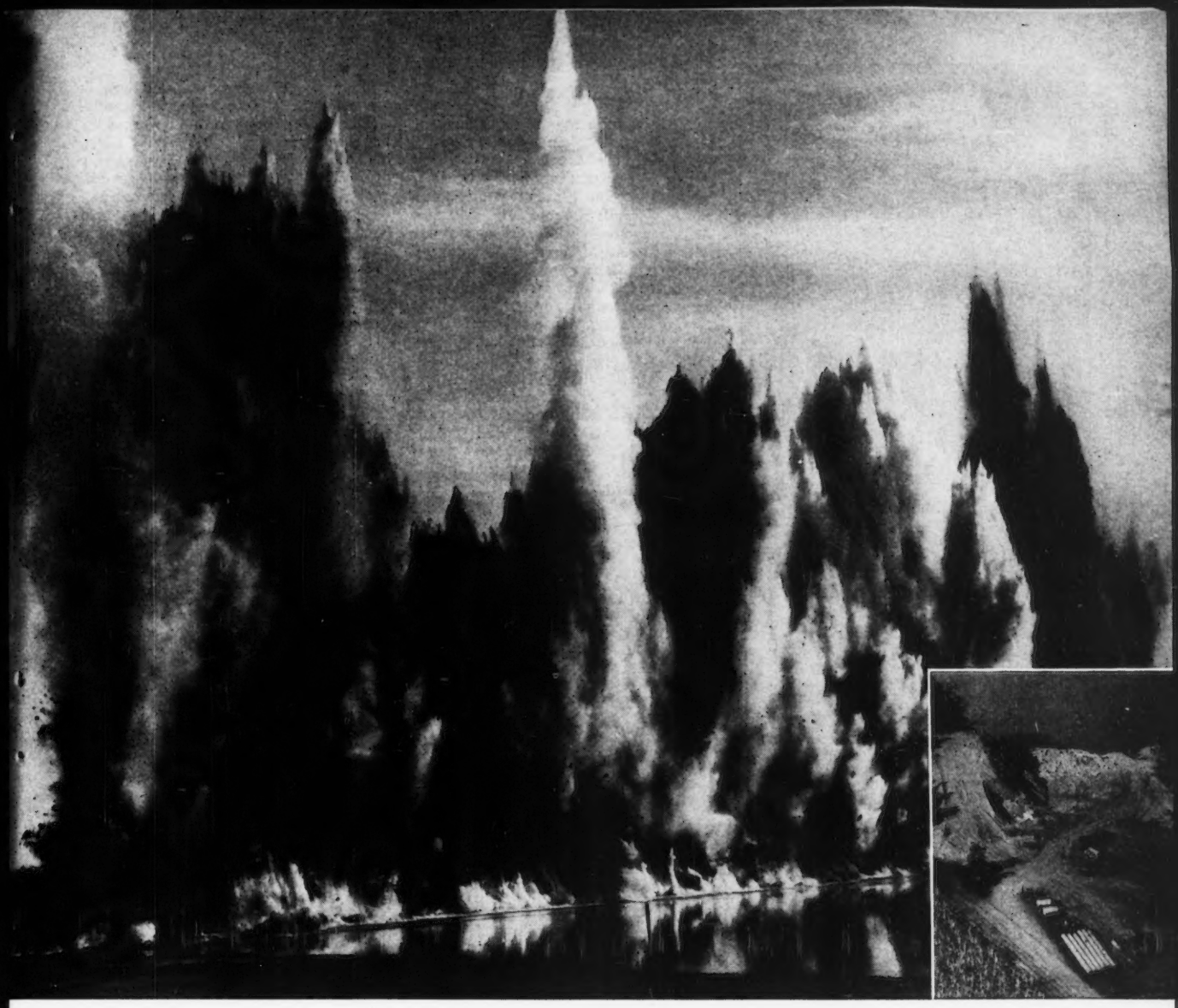

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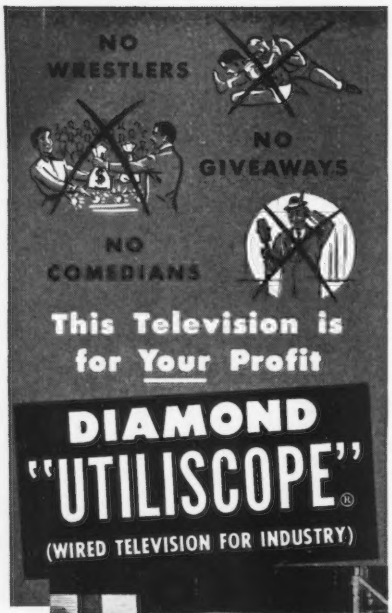

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Japan *(Continued)*

tion is 1.5 tons a month now, and will be 10 tons a month early next year.

By using the titanium powder, the company developed a highly durable, heat and erosion resistant alloy called Titanize. It is 95% aluminum and 5% titanium, and is used for surface treatment of steel. Monthly production of Titanize is 5 tons now, but will be increased to 10 tons in near future. Orders have been placed already by Niigata Engineering Works, Japan Special Steel Corp., and Japan Steel Tube Co.

Okubo said also that surface treatment of steel with Titanize will ensure higher durability, heat and erosion resistance than aluminized steel, and give steel all advantages of stainless steel and special steel. Its use is very wide, he said.

The cost for Titanize treatment of steel is approximately 60,000 yens ($167) per ton of steel.

Japanese and U.S. patents are pending now for these processes.

IN THE PHILIPPINES

Philippine Iron Mines plans to erect a new plant at Larap to make use of currently-wasted high sulphur ores, according to A. Soriano y Cia., consulting engineers for the company.

Atlas Consolidated reports that a 500-ft wooden pier has been completed at Sangi Beach, Toledo, in Cebu Province, for loading copper concentrates from the Toledo Mine. The Toledo Mine is slated to enter production in a few months.

All copper and pyrite concentrates will be hauled 10 mi from the mine and mill in diesel trucks. Conveyor belts will effect continuous loading at 200 tph into ore carriers.

Atlas Consolidated, operating company for the Toledo Mine, already has signed a 3-yr contract with the Mitsubishi Co. in Japan for sale of half the copper concentrates produced.

Benguet Consolidated reportedly plans to increase its daily milling rate of gold ore to 4000 tons from its present rate of 2800 tons. An additional $2-million is to be invested. Present annual payroll is more than $4.5-million.

Gold production now exceeds $900,000 monthly from Benguet and Balatoc. Gold price in the open market was steady at 110 pesos an oz.

IN SCANDINAVIA

DENMARK

Exploration of lead-zinc deposits at Blyklippen, Mesters Vig, eastern Greenland, has indicated tonnages valued at 100-million kroner (about $15-million), it was announced in Copenhagen recently.

The deposit is owned and worked by the Nordisk Mining Co., shares of which are held by Frobisher, Ltd., a subsidiary of Ventures, Ltd.; the Danish government, various Danish private interests and two Swedish firms, Boliden and Stora Kopparsberg. Per Kampmann was listed as president of Nordisk Mining Co.

Plans call for processing to begin in the summer of 1956 with first shipments set for that autumn.

The deposits were discovered several years ago by a Danish party under Dr. Lauge Koch.

IN THE NEAR EAST

ISRAEL

Discovery of new phosphate deposits averaging 34% concentration was reported in Tel-Aviv. Neither location nor figures regarding estimated availabilities were disclosed.

It was reported further, however, that two calcinating units with a capacity of 150,000 tons each will be ordered abroad. Construction of the first plant is to begin within a few months in the Negev Desert, a few miles south of Beer-Sheva.

Mineral resources in Israel are operated by a government holding company, Department of Mines and Quarries.

IN EUROPE

SPAIN

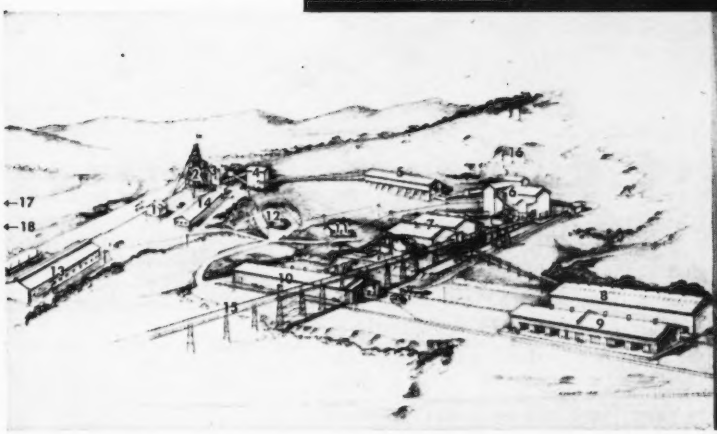
Rio Tinto copper mines in southwestern Spain plans to boost production soon by extensive use of low-grade ores. Not a major copper nation, Spain in 1953 produced only a reported 9406-tons. Whereas copper deposits are spread throughout the country, few are of importance.

IN AFRICA

Kilembe Mines in Uganda has signed a contract with Edward L. Bateman Co., Johannesburg, South Africa, for construction of the following facilities to produce copper and cobalt: (1) a concentrator to be designed as a two-stage flotation plant, which will recover copper from ore in the first stage, cobalt in the second, treating about 40,000 tons of ore a month; (2) a roasting plant at the mine; (3) a 6000-kva hydroelectric power plant; (4) a smelter at Jinja; (5) a cobalt recovery plant. Estimated cost of the project is about $8-million.

Tanganyika Elephants couldn't tear this up!

...SWECO saw to that



Under construction in Central Africa

This perspective drawing shows part of the integrated lead-copper mine, mill and off-site facilities engineered by SWECO for Uruwira Minerals, Ltd., at Mpanda, Tanganyika, Africa:

1 Hoist house
2 120′ headframe
3 Jaw crusher
4 Cone crusher
5 3000 ton ore storage
6 SWECO designed heavy media separation
7 Grinding and flotation
8 Concentrate storage
9 Warehouse
10 Shops
11 Main office
12 Survey office
13 2000 KW power plant
14 Change house
15 Tailings conveyor
16 Reservoir
17 Village for 5000 workers
18 Housing for 200 personnel and families

Sweco engineering team *(above)*

This project group evaluated preliminary flow-sheets, developed detailed plans and specifications, procured and supervised the shipping of all materials required to create the big Uruwira lead-copper mill and a complete new town.

The threat of marauding elephants was just one of literally thousands of details considered by SWECO in designing, engineering and procuring more than $2,000,000 worth of equipment, materials and supplies for the complete 1,200 ton/day lead-copper concentrator of Uruwira Minerals, Ltd.... 800 miles inland, in the bush of Tanganyika, Africa. Water is piped 43 miles to the project from the Ugalla River, over rough terrain, varying 1000 feet in elevation. The water pipes and two 500,000 gallon reservoirs are buried to protect them from thirsty elephants during drought seasons. Water supply was one of many problems which SWECO engineers solved in setting up complete, integrated plans and specifications for concentration mill, utility services and all off-site facilities—a 2000 KW power plant—a village for 5000 workers, complete with housing, school, hospital—attractive California-style three-bedroom houses for 200 supervisory personnel and their families. SWECO specified, purchased and coordinated shipping of more than 3,000 tons of equipment and supplies from all parts of the United States, everything from structural steel and forming lumber to hand tools and nails. The thoroughness, speed and efficiency with which SWECO handled the Uruwira Minerals project are the result of 30 years of engineering, construction and manufacturing services to process industries throughout the world.

Send for bulletin giving details of SWECO *engineering-construction and manufacturing services.*

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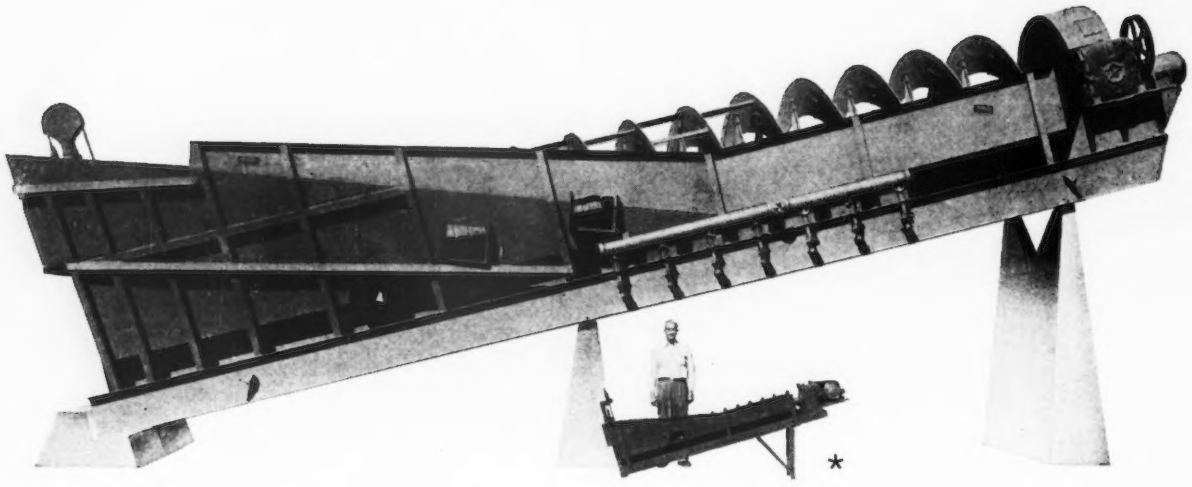

WORLD'S LARGEST SPIRAL CLASSIFIERS

TWO 84" DIAMETER WEMCO S-H CLASSIFIERS

Illustration shows one of the two large classifiers recently completed by Wemco for installation in the iron-ore beneficiation circuit of a major producer on the Mesabi Range. These units will serve to wash and deslime fines in a plant having an overall capacity of 700 LTPH. They also will operate to prepare feed for a cyclone treatment plant.

Whatever your classifier problem— WEMCO offers a model to fit your job

Whether you have a small, medium or large tonnage circuit, the exclusive design of Wemco S-H Classifiers offers flexibility to suit your particular operations. In addition to a wide range of sizes, Wemco Classifiers offer many design variations: simplex or duplex — straight, modified or full flare tanks — single, double or triple spirals — high, standard or submerged weirs — and short, medium or long lengths.

Modern Design Gives Wemco Classifiers these METALLURGICAL ADVANTAGES

Greater overflow capacity — up to 25% more effective pool area.

Sharper separation — due to controlled agitation and larger effective pool area.

Greater raking capacity — advanced pitch design provides up to 100% greater sand conveying capacity.

Balanced operation — between overflow and raking requirements.

★ Photo shows size comparison between 84" and 12" Wemco S-H Classifiers.

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Africa *(Continued)*

Government of Gambia and the British Titan Products Co. Ltd. have made a 30-yr agreement under which the British firm will develop titaniferous mineral resources of Gambia through a subsidiary, Gambia Minerals Ltd. Reports from Bathurst say that the British company's capital outlay will be about £250,000.

Companie Phosphate de Gafsa has completed construction of a plant at Metlaoui, Tunisia, to wash and enrich low-grade phosphates from the Tunisian-Algerian border.

Company officials hope that this plant will improve the competitive position of Tunisian phosphate producers.

President Brand, said to be the richest mine in the new Orange Free State gold field thus far, has had its first official pour.

A 75,000 tons-a-month plant had been operating on a test basis since March at the Brand. Gold recovery reportedly was such that only two mines in the whole of South Africa were obtaining better averages. These other two mines were listed as the West Driefontein and the Blyvooruitzicht, both of which have been operating for years.

A new winder was to begin operating this month at Ariston Gold Mines in West Africa. The new winder is designed to step up hoisting capacity to 40,000 tons a month.

Even before installation of the new winder, or hoist, new operating records were being set at Ariston Gold Mines. In August, 35,000 tons of ore were crushed, 500 tons more than in July. Gold recovery in August amounted to 11,975 fine oz, also a new record.

The tonnage in August exceeded by an appreciable margin the mine's rated capacity. With the new winder in operation, it is expected to be only a matter of time before even greater operating records are set.

Sees 200-Million Ton Steel Capacity by 1979

The steel industry is growing with a vigor that makes predictions of 200,000,000 tons of annual capacity within the next 25 years seem conservative, according to Edward L. Ryerson, chairman, executive committee of Inland Steel Co.

Speaking at ceremonies dedicating the restoration of the first iron works on the North American continent, at Saugus, Mass., on Sept. 17, Mr. Ryerson said that the industry which started here 300 years ago has an almost unlimited future.

"Steel is so basic to all other production," he said, "that its uses multiply with each new development of labor saving devices and push-button operations in the home and farm and factory. The demand for steel could easily double within a generation," he added.

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Greensburg storage battery locomotives

5 TON HIGH TYPE MONITOR

Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. **Advanced engineering design** and **custom-building** to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

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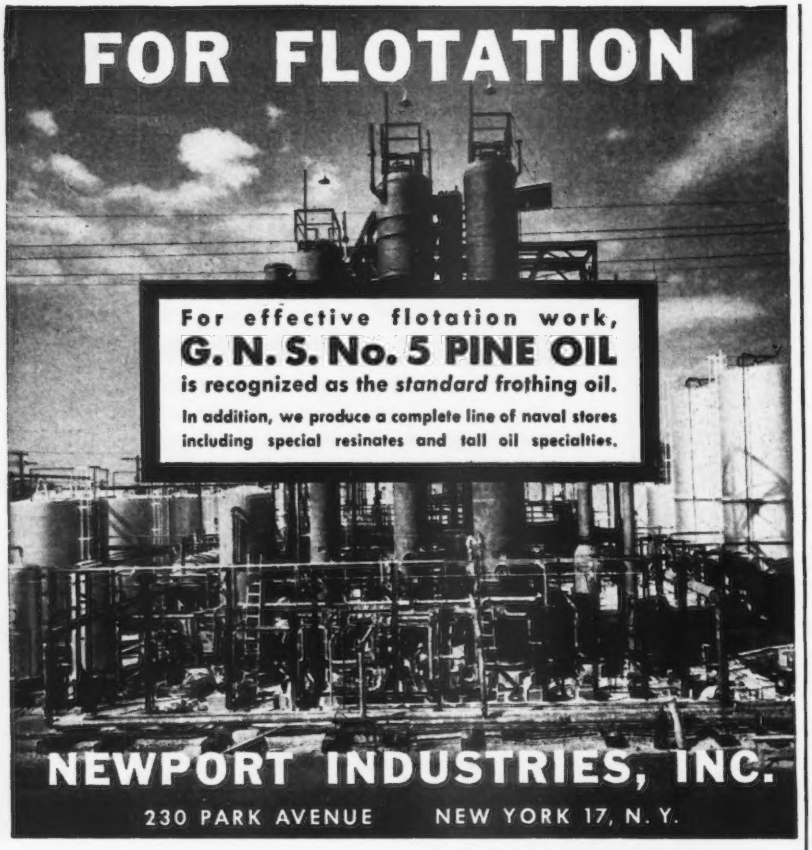
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Petaca Mining Corp. Plans $300,000 Mica Mill

FOUNDATIONS ALREADY have been laid and overhead steel construction is about to begin on a $300,000 mica mill near Santa Fe, N. M.

The mill is being built by the Southwestern Engineering Company of Los Angeles for Petaca Mining Corp. Petaca is operated by Brothers of the Christian Schools, a world-wide Catholic Order devoted to teaching.

Details of the mill construction were announced in New York in mid-September when 900,000 shares of the Petaca Mining Corp. went on public sale.

Major stockholders with a 55% interest is the Christian Brothers Order's St. Michael's College Foundation Inc. Its share of mining profits will go toward endowing St. Michael's College, a 270-student liberal arts college in Santa Fe.

Brother Benildus, college president, said that Petaca's objective is the profitable mining of mica and also columbium, tantalum, monazite and uranium in New Mexico and Utah.

The mine-mill unit "will be the most complete mica operation anywhere in the United States," Brother Benildus said. The mill is to process 300 tons of mica ore per day and produce 60-75 tons of saleable mica concentrate when the mill hits full production next year, he added.

Petaca has 22 mining claims covering 440 acres in New Mexico and a 50% interest in 77 uranium claims on the Colorado Plateau.

Some $300,000 of the funds realized from the public stock sale will be applied toward mill construction. Another $25,000 will go into exploration of Petaca's uranium claims.

Anaconda to Expand Bluewater U_3O_8 Plant

ANACONDA COPPER Mining Co. is expanding its uranium ore processing plant at Bluewater, N. M. This expansion follows closely the recent discovery by Anaconda of additional deposits of sandstone uranium-bearing ores in that area.

The current expansion is the second since Anaconda began mining and processing uranium ores a few years ago (see *E&MJ*, August 1954, p 96).

Construction of additional units already is underway and should be completed in 1955.

When completed, the Bluewater plant will be equipped to treat limestone uranium ores in increasing quantities by the carbonate leaching process and the sandstone ores by an acid leaching process.

The Anaconda plant is treating not only ores mined from Anaconda properties but also ores mined by other operators. Anaconda has mines operating in sandstone uranium-bearing ores on the Laguna Indian Reservation near Grants and also another mine working in limestone uranium-bearing ores outside the Reservation near its Bluewater plant.

Collects More Dust for Fewer Dollars!

Type W ROTO-CLONE design makes it the lowest priced, high efficiency wet dust collector in its class

Why is ROTO-CLONE lower priced? The Type W is strictly a product of AAF research—features a patented design that combines high efficiency with inexpensive construction. Result—the lowest priced wet dust collector in its class (units of 1,500 to 50,000 cfm capacity designed for high efficiency dust collection, including extreme fines).

Why are space requirements less? ROTO-CLONE provides everything you need, except duct connections, in one complete, shop-assembled package—high efficiency collector, exhauster, motor and drive. This compactness makes its relocation easy and economical with change in process, plant layout or production equipment.

Why is performance outstanding? Ingenious addition of water sprays extends the effectiveness of this dynamic precipitator to the collection of the finest, lightest dust particles. Unit requires little maintenance; uses a minimum of water and maintains efficiency regardless of variation in air volume.

For complete information, call your local AAF representative or write direct for Bulletin 274.

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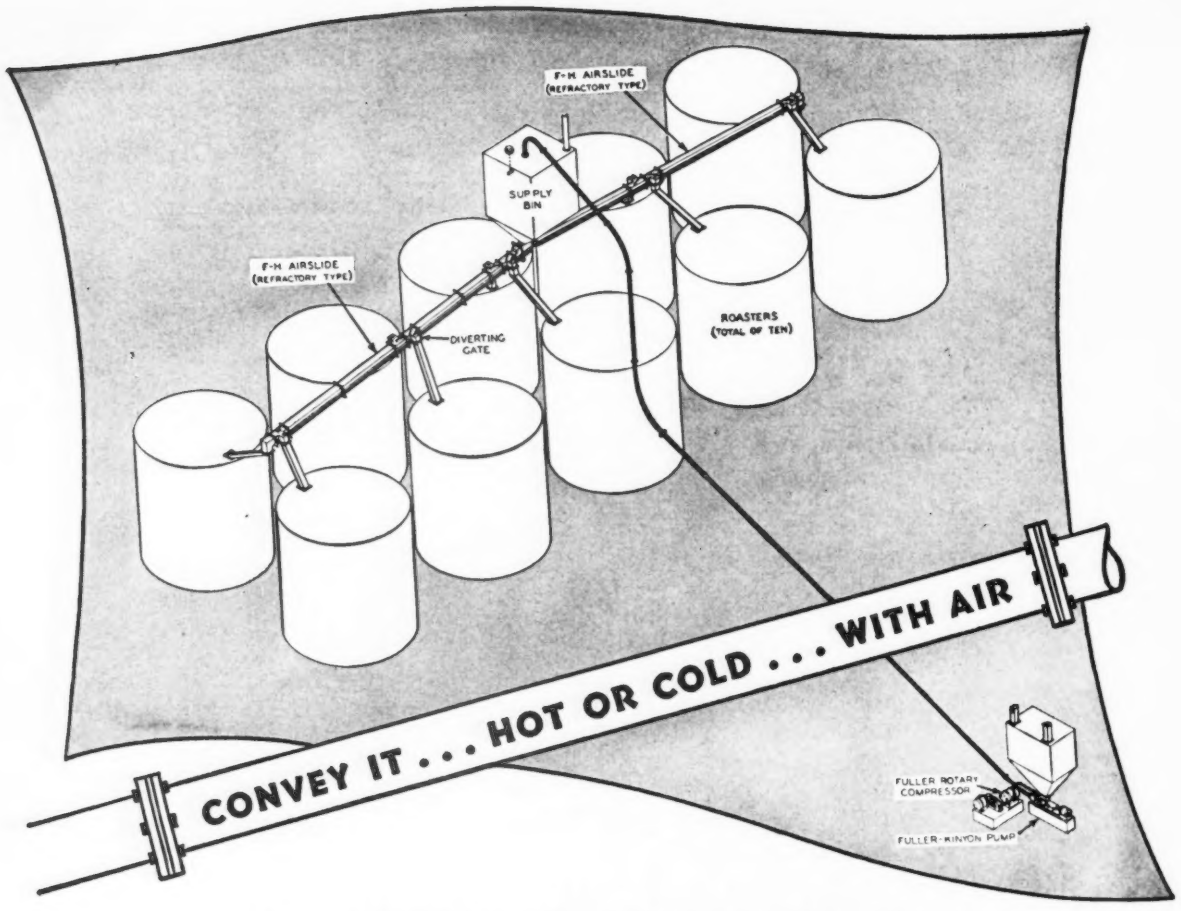
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SUPPLY BIN
F-H AIRSLIDE (REFRACTORY TYPE)
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ROASTERS (TOTAL OF TEN)
CONVEY IT . . . HOT OR COLD . . . WITH AIR
FULLER ROTARY COMPRESSOR
FULLER-KINYON PUMP

Noranda Mines handles hot flue dust with Fuller-Kinyon Pump and F-H Airslides

The problem of conveying many dry, pulverized materials, heretofore considered impossible and impractical from an ecomomic standpoint, is now being solved by the use of air through dust-tight, contamination-proof pipe lines. Be the material hot or cold, Fuller-Kinyon Conveying Systems and F-H Airslides, either individually or in combination, have proved their worth in many industrial plants.

The drawing above illustrates how Noranda Mines solved its problem of handling hot flue dust in a highly satisfactory and profitable manner. The Fuller-Kinyon Pump, lower right of drawing, conveys at rate of 25 tons an hour, from a precipitator collecting hopper to a supply bin above ten roasters. From the supply bin the material is discharged to F-H Airslides, which convey and distribute uniformly to the roasters. And, this is accomplished with no dust or loss of material. Flue dust has a temperature up to 800 deg. fahr.

A Fuller Rotary Single-stage Compressor furnishes approximately 478 c.f.m. of air at 15-lb. pressure, to the Fuller-Kinyon Pump, through a direct-connected air line. Air, where and when needed, to do the work required in a highly satisfactory and economical manner.

When your problem is conveying dry, pulverized materials, why not consult us. A Fuller engineer will be glad to make a study of your layout and, if feasible and warranted, make suggestions for the betterment of your operation.

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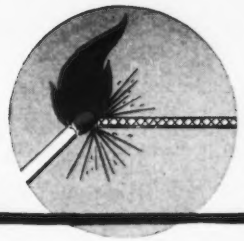

LIGHT IT-*and walk away!*

Ignitacord will ignite every fuse in the round

Less hazard and *greater efficiency* are two reasons why the new type IGNITACORD* is gaining favor for rotation firing.

1. The Blaster lights the Ignitacord at one point — and leaves the face. The Ignitacord can be ignited with safety fuse to obtain a longer delay if desired.

2. All fuses in the round are cut to uniform length. There is no need for trimming, since accurate time delay and proper rotation is governed by the length of Ignitacord used between holes.

IGNITACORD burns progressively at a uniform speed along its length with an external flame at the zone of burning. The flame is short and hot — acts like the flame of a Hot Wire Lighter.

Two types are available. Type A burns at approximately 8 to 10 seconds per foot. Type B burns at approximately 16 to 20 seconds per foot. Each type is packed on 100-foot spools with identifying label. Both types are color-marked at one-foot intervals, making it easy for the Blaster to connect the fuses at correct intervals.

IGNITACORD CONNECTORS provide the most efficient and convenient method of attaching Ignitacord to Safety Fuse. The Connector is a metal shell containing an ignition charge. The shell is slipped over the freshly cut end of the fuse and crimped. A slot near the opposite end receives the Ignitacord, which is held firmly in place when the top is pressed down against it. Ignitacord Connectors are supplied in packages of 100.

*Sold on the West Coast under the name of SPITTERCORD by the Coast Manufacturing and Supply Co., Livermore, California.

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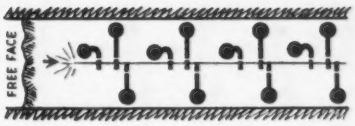
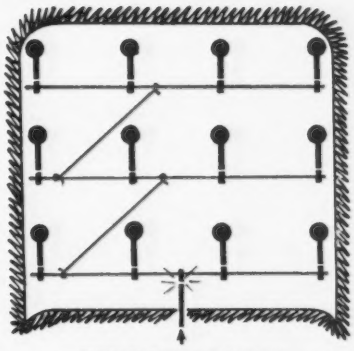
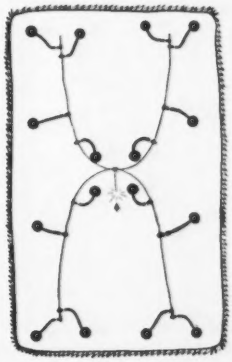




FIRING STOPE ROUNDS

Fig. 1 shows a stope drilled with three rows of uppers, the fuse from each hole being connected to a single line of Ignitacord. Note that the center holes will fire before the two corresponding rib holes.

In *Fig. 2* the fuses extending from the horizontal breast holes are connected to four lines of Ignitacord at regularly spaced intervals. Jumper lines connect the horizontal lines, and the Igniter cord is activated by a length of Safety Fuse at Point A.



FIRING DEVELOPMENT ROUNDS

Fig. 3 illustrates an Ignitacord hook-up arranged to fire the cut holes in one group, and the remaining holes in the proper order of rotation. Ignitacord lines should always be kept separated enough to avoid cross ignition.

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Operating five large track-type tractors each with 12 bottom rollers, 4 carrier rollers, 156 track links, 78 grouser pads, 2 idlers, 2 sprockets and one dozer blade, replacement cost was figured to be approximately $13,800. Rebuilding these parts with the Amsco Leader cost approximately $3,700 or a saving of about $10,000. Plus the fact that the rebuilt parts gave nearly double the service life of new parts.

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AMERICAN MANGANESE STEEL DIVISION
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The new double flexible seals on Jeffrey PERMASEAL Belt Idlers are hailed as the greatest advance in conveying engineering in the last 20 years.

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Jeffrey PERMASEAL Belt Idlers with new double flexible seals are available in all types and sizes. They will vastly improve your complete conveyor operations.

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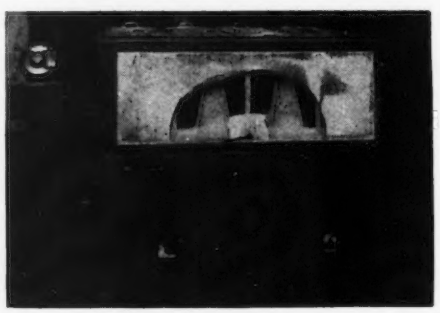
Above: Installation of Jeffrey PERMASEAL Belt Idlers at the Pennsylvania Railroad's new Philadelphia ore dock. Twin 54" belts convey an ultimate capacity of 10,800 TPH. Each belt travels 80' to top of terminal house at rate of 500 FPM.



Airborne-dust test in Jeffrey Research Laboratory (unretouched).

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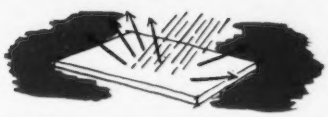

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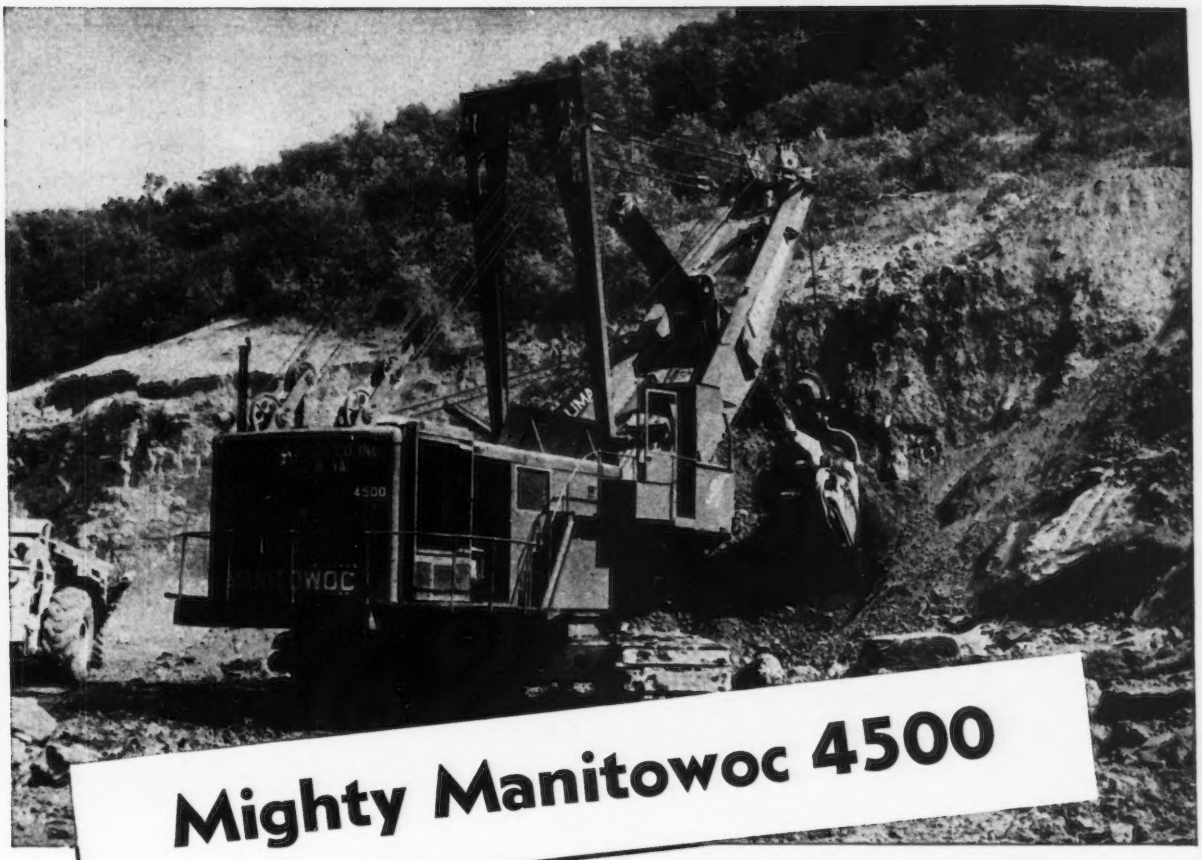

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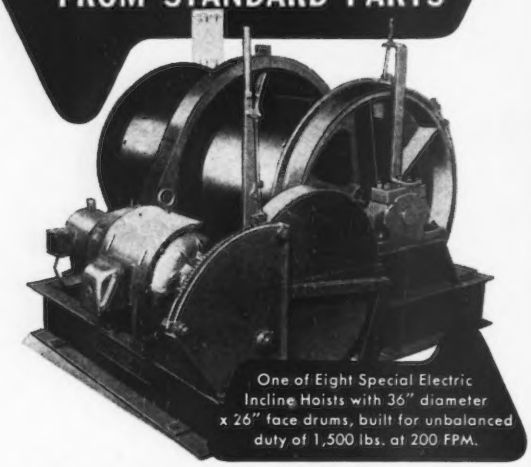

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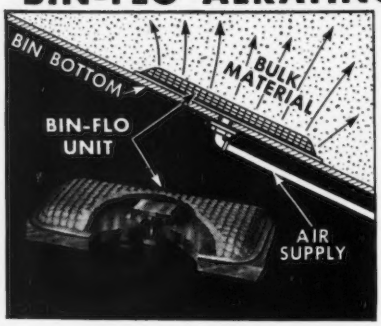

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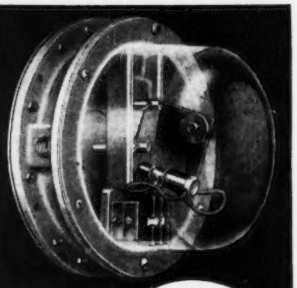

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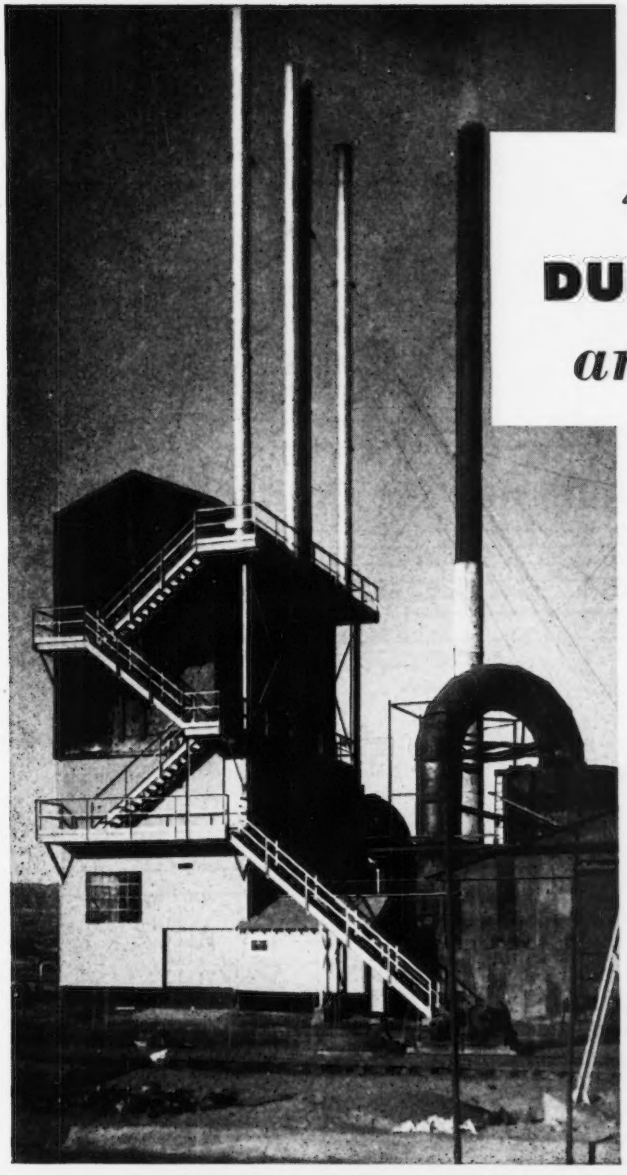

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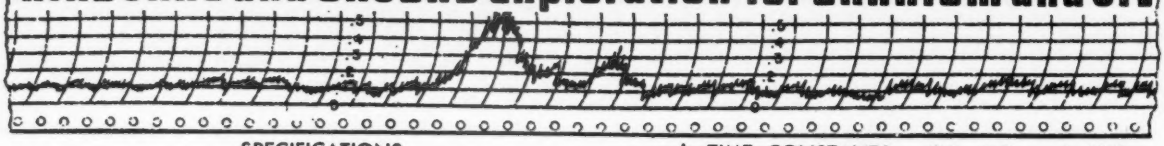

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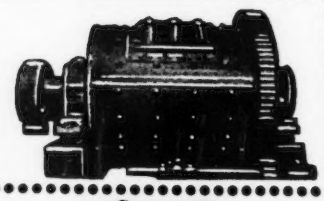

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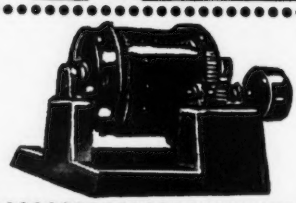

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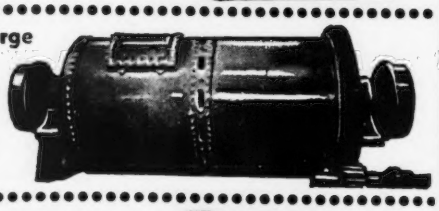

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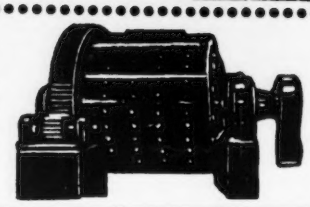

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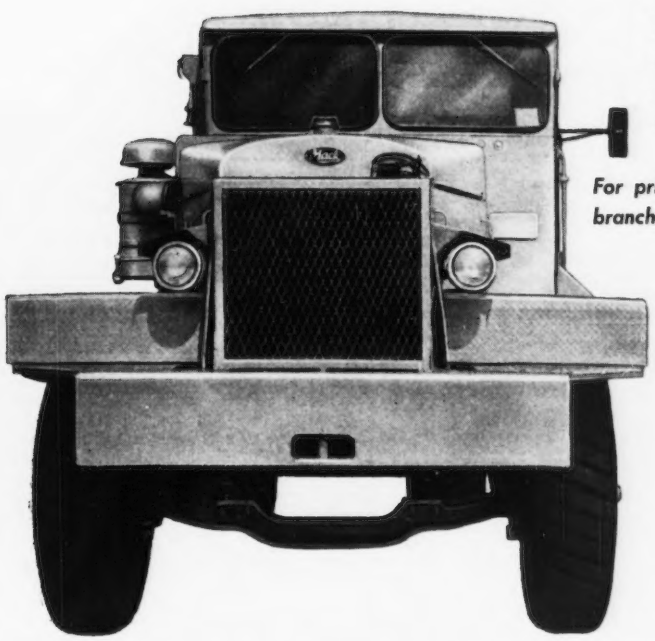

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A bad haul road can slow down fast hauling equipment. There's no such problem at this copper pit in Kimberly, Nev. A Caterpillar No. 12 Motor Grader is on the job keeping hauling equipment working efficiently.

Four million tons of overburden are being stripped. Six DW21s wheel along a half-mile haul road 20 hours a day. They carry big loads *fast* because the No. 12 travels 30 miles a day smoothing out rough spots. Costs per load drop, profits rise.

Like so many mining operations, this is a *Caterpillar team job.* Besides the motor grader and the fleet of DW21s, three D8s are on the job.

Economy-minded mining firms have found it wise to standardize on big yellow machines. Their operators become familiar with one make of equipment. This benefits owners with bigger production – lower maintenance costs.

Mechanics, too, are able to do a bigger day's work. They get to know one make of equipment. Many Caterpillar parts are interchangeable. Grease, oil and fuel are the same – all Cat Diesel Engines operate on ordinary No. 2 furnace oil without fouling.

Finally, you get the benefit of quick, efficient, one-stop service from one dealer – your Caterpillar Dealer.

Any Caterpillar-built machine builds profits. With a fleet of Cat equipment your profits go up. See your Caterpillar Dealer soon. Talk to him, inspect the equipment, and then have him demonstrate it on your job!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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*Both Cat and Caterpillar are registered trademarks—®

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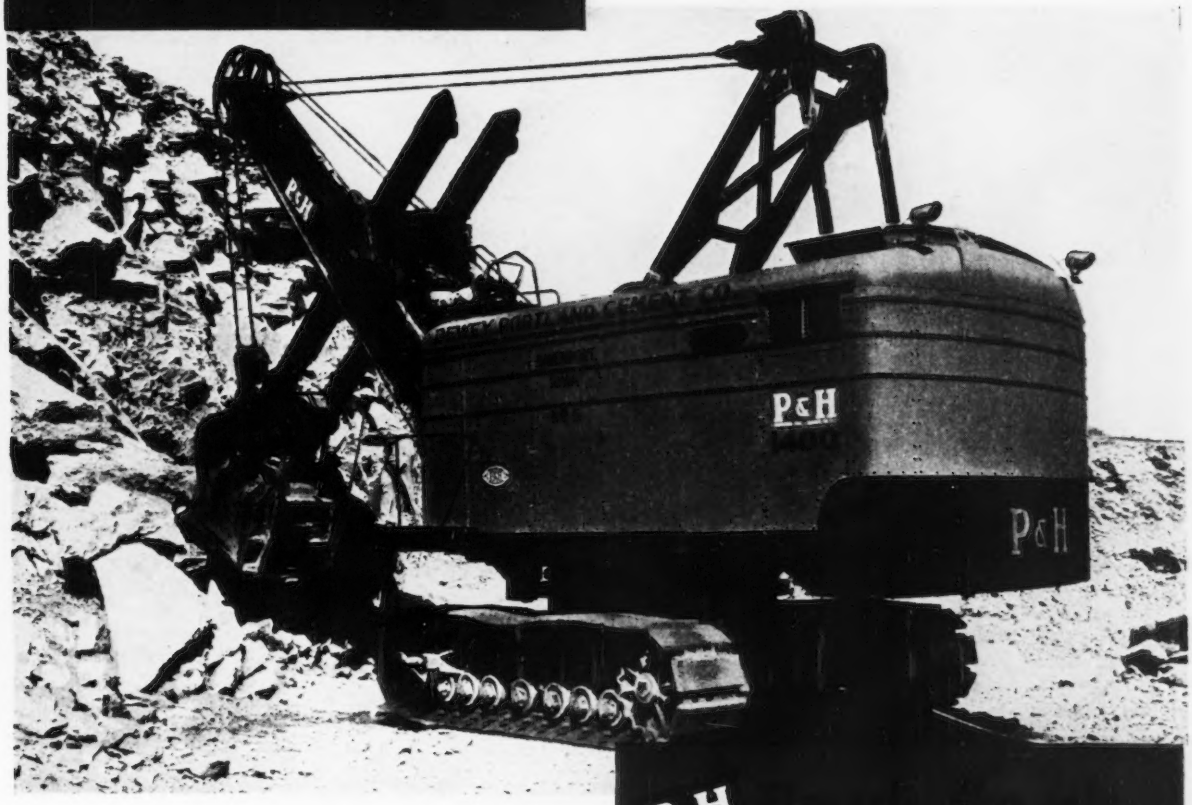
9,000,000

tons of limestone . . .

heavy duty all the way



P&H

"THE PRIDE OF THE PIT"

Here's a case history, typical of P&H dependability . . . At Davenport, Iowa, Dewey Portland Cement Company's Model 1400 has moved 9,000,000 tons of stone on the same straddle-type dipper sticks — yes, on the same racks and pinions, with a minimum of maintenance on hoist cables and dipper. *And still going strong!* On the basis of performance like this, *Dewey Portland Cement has since placed another P&H Electric Shovel (Model 1500) in operation.*

Obviously there's no crowd cable maintenance with the rugged P&H heavy-duty worm-driven crowd machinery. Performance like this comes from better basic design . . . with straddle sticks that follow the old adage of two handles on a loaded wheelbarrow.

Furthermore P&H backs up this sensible front-end design with special stressing and special steels that won't become brittle or break even when temperatures drop to 40° below zero. But let us send you our Bulletin X-139 and you'll get all the facts that explain why every third P&H Electric sold is a repeat order!

P&H ELECTRIC MINING SHOVEL DIVISION

HARNISCHFEGER

CORPORATION

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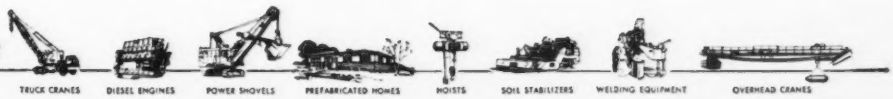
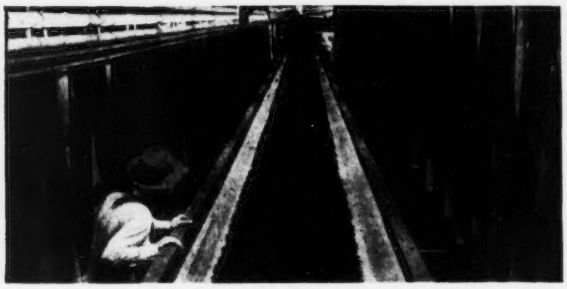
the P&H *Line*



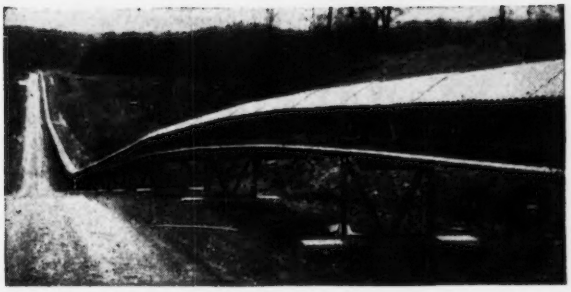
FOR LONG-LIVED, HEAVY-DUTY CONVEYORS..

IT'S TIMKEN®...



One section of a 3000 ton-per-hour Hewitt-Robins conveyor system that's moving ore to a weigh station. To assure long life and trouble-free operation, the idlers are equipped with Timken tapered roller bearings.

AND TIMKEN AGAIN!



One of the world's longest 24" belt conveyors carries coal 1½ miles from mine tipple to power company. A Jeffrey belt conveyor, it handles 300 TPH of 2"x 0" coal. Timken bearings on the idlers reduce friction and belt wear.

AND TIMKEN...

Wood chips ride to pulp processing on this 42-inch conveyor. The Chain Belt idlers are mounted on Timken bearings to keep them running smoothly with minimum maintenance.

AND HERE ARE SIX BIG REASONS WHY:

1. **THOROUGHLY PROVED.** The Timken® bearing is the only tapered roller bearing proved by 15 years or more of service in heavy-duty conveyor installations using the popular dead shaft construction.

2. **EXTRA CAPACITY.** Line contact between rollers and races gives Timken bearings high load capacity. And by using Timken bearing sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost you *less* than the smaller sizes you'd normally use.

3. **LONG-LIFE LUBRICATION.** Not just lubricated for "life", but lubricated yearly, or as conditions require, to insure *long* life. Fresh lubricant ends any chance of gummy, sticky, jammed bearings.

4. **LONGER ROLLER AND BELT LIFE.** Less sliding and scuffing between idlers and belt.

5. **FRICTION MINIMIZED.** Timken bearings' true rolling motion and extremely smooth surface finish practically eliminate friction.

6. **MAINTENANCE REDUCED.** Long life and dependable performance of Timken tapered roller bearings cut maintenance to a minimum.

Remember "Timken" is not a bearing type. It is a trademark applying to bearings made by The Timken Roller Bearing Company. Always insist on Timken bearings in the conveyors you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
TAPERED ROLLER BEARINGS

Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ⊣▯⊢ LOADS OR ANY COMBINATION ✳